Medieval markets: a soil micromorphological and archaeobotanical study of the urban stratigraphy of Lier (Belgium)

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Abstract

Market places remain underrepresented in studies of archaeological soil micromorphology. In Lier, micromorphology was applied to gain understanding of the stratigraphy and formation processes of the medieval “Grote Markt”. Block samples were obtained from a sediment profile that spanned the 11th-15th century and contained three separate phases of thick, dark-coloured, humic, homogeneous layers - so-called ‘dark earth’. Combined with textural and archaeobotanical analyses (seeds, fruits and phytoliths), the results shed light on the formation processes that shaped this site.

The oldest dark earth, dated to the 11th century, was characterized by agricultural activities. The second dark earth (12-13th century) formed as a result of intensive human activities, witnessing the site’s transformation to an urban space. This layer contained large amounts of organic matter and anthropogenic inclusions and developed gradually *in situ*. It probably represents an early market or open space close to dwellings or small courtyards. Units that contain evidence for intensive building activity separate the second and third dark earth, and are possibly the result of a spatial re-organisation of the square. The formation of the third dark earth, which started in the 14th century, is characterised by an intensification of traffic and craftworking activities. Surfaces may have been maintained by spreading organic matter such as leaves, sand and hearth detritus. However, there is no evidence for a kept, empty urban square before a thick layer of levelling sand was deposited (in the second half of the 14th century at earliest) and the market was cobbled. The analysis shows that mixed market activities took place in this intensively used zone, and presents a number of micromorphological characteristics and inclusions typical of a medieval market place in a temperate climate.

Keywords
Soil micromophology, archaeobotany, dark earth, urban archaeology, medieval town, market

1. Introduction

Market places today are regarded as the most emblematic places of many, if not all medieval towns in Western Europe. They are considered to be the theatres of the late medieval urban identity and are often related to the origin of the towns. However, the market place as an urban phenomenon is a relatively young one compared to the early origins of towns and trade in this region. We now know that before actual market places were organised as such, trade and exchange took place in different spatial settings, such as assembly sites, often outside early towns and central places (see for instance Mehler, 2015), or at the quaysides and associated streets of early medieval long distance ports such as Hedeby and Dorestad (Kalmring, 2010). The spatial setting for trade and exchange gradually shifts towards halls and constructed squares with market infrastructure, the urban markets we still know, between the late 12th and the early 14th century (see for instance Schofield and Vince, 2003; Biermann, 2015). These places are called '*forum*', referring to the Roman '*villa fori*'. For instance, the famous cloth hall of Bruges was only constructed by AD 1240, transforming a muddy wasteland outside the oldest town wall into the 'Grote Markt' (Verhulst, 1999). In Ghent, the largest market place, the 'Vrijdagmarkt', was designed and developed in the early 13th century on the place of old house blocks (Boone, 2010). It is only with the rise of the new towns of 13th century France and England that market places are included in the initial design and ground plan (Schofield and Vince, 2003). It is an intriguing question why and how the mental concept of the "forum" was re-invented at the dawn of the late medieval period, but it is clear that we are dealing with a deliberate transformation of the fabric and spatial structure of the late medieval towns in the same period. However, we lack data on the chronology of this transformation, on the gradual shift of the mental sense of place of 'having a market' towards the spatial development of the well-known market places in the centres of towns.

The archaeological record has the potential to provide direct markers of such chronology. The excavation and research of the origins of the late medieval market place of Lier are of great importance here, since they show when and how a non-urban environment was transformed into a physical market place, creating not only infrastructure but also a new urban setting and identity. Documenting this chronology in the archaeological record requires a good understanding of site formation and post-depositional processes. Micromorphology has repeatedly proved to be particularly useful for the identification of such processes (Courty et al., 1989; Gebhardt and Langohr, 1999; Matthews et al., 1997; Goldberg and Macphail, 2006; Milek and French, 2007; Devos et al., 2013a). At the same time the topic of markets, and more specifically medieval market places, is severely underrepresented in studies of soil micromorphology. Medieval indoor occupation deposits close to markets were studied using micromorphology at Ely and Peterborough (UK) (Milek, 1997), and domestic activity from medieval to early modern times was studied on a plot near the New Market area in Wisbech (UK) (Hinman, 2012; Milek and French, 2012). However, evidence for the market place itself was not found in any of these deposits. At present, the only existing comparison is the micromorphological study performed in Magdeburg (Goldberg and Macphail, 2006; Macphail et al., 2007), which includes analyses of building debris on the site of the Ottonian church and a medieval "dark earth" (10-13th century) from an open, exterior market area in front of it. The latter location became the New Market in the 13th century, and evidence was found for stock and middening activity, as well as for bronze casting.

2. Regional setting and historical background

The site of the Grote Markt in Lier is situated in the present centre of the town (Fig. 1a). The current elevation level is approximately 7,57 m above sea level. Geographically, this area is part of the southwestern Campine region, characterised mainly by wet sandy to loamy sandy soils (Goolaerts and Beerten, 2006). The town of Lier is located in the river Nete basin, just north of the confluence of the Kleine Nete and the Grote Nete, which both pass through the town. Both rivers are characterised by an irregular discharge (high in winter, low in summer), in the past leading to regular inundations in winter (Baten and Huybrechts, 2002).

The Grote Markt is located on the right bank of the 'Kleine Nete'. According to the quaternary geological map, the site is situated near the border of an area characterised by the presence of cover sands and silts, and the Holocene alluvial deposits of the formation of Singraven. The latter are composed of clay, peaty and silty fine sand and sometimes coarse sand (Goolaerts and Beerten, 2006).

According to the written sources, in the case of Lier the transformation towards a physical market place happened between the 12th and 14th century. The town originated as a stronghold with a minster church in the early 11th century, with some ties to an early medieval central place Alier ("Old Lier") in its immediate surroundings. The urban character of Lier only developed during the 12th century, and especially during the 13th century the town witnessed a rise in production and trade of textiles. In 1275 the cloth guild of Lier was given a special privilege to organise the sale of cloth by Duke John I. In the same period, the Dukes of Brabant also developed a market infrastructure in Lier in the form of a set of specialised market halls in the centre of town (Breugelmans et al., 1990). The town took the market hall system into its own hands at the start of the 14th century, and received a new special privilege to hold a textile market in 1338. This privilege must have provided the context to reorganise the market infrastructure of Lier, since shortly afterwards a temporary cloth hall was built, which was replaced by a more prestigious cloth hall in stone in 1367, together with a Belfry tower to mark the identity and independence of Lier (Breugelmans et al., 1990). While it is clear that these construction works must have had their impact on the spatial and material characteristics of the market place around the hall, it remains unclear how the area of the market place was used and organised before, though it seems that its existence goes back to a property (wasteland?) of the duke of Brabant.

At the site, a sequence of three dark earths was found in the stratigraphy of profile *1bis* (Fig 1b, Fig. 2). The upper dark earth (unit 720), dated to the 2nd quarter of the 14th century based on the ceramics, lies at ca. +6,40-6,70 m. The middle dark earth (unit 725, dated at earliest to the final quarter of the 12th century) lies between ca. +6,0 and +6,27 m above sea level, and the top of the lowest dark earth layer (unit 813) at ca. +6 m.

Dark earths are homogeneous, non-peaty, dark brown or black-coloured units, frequently rich in anthropogenic remains. Originally a term used for the units between Roman and medieval urban strata in the UK (e.g. Macphail, 1994), the study of other European sites (for an overview see Nicosia et al., 2013) has demonstrated that dark earths can occur anywhere and in any given period. It should be remembered that the term "dark earth" can only be used as a provisional or descriptive concept and never an interpretive one, since the range of materials and activities that formed the original archaeological deposits is very diverse despite their often severely altered or bioturbated state (Macphail et al., 2003; Fondrillon, 2009; Devos et al., 2011, 2013a; 2013b; Nicosia and Devos, 2014). Examples of these activities include digging, ploughing, manuring, the use of the site for grassland/pasture, house construction, craft production, animal stabling, middening, loam extraction pits, etc. (Galinié, 2004; Macphail, 2010; Devos et al., 2011; Wouters et al., 2016).

A soil micromorphological study was undertaken to investigate the processes that led to the formation of the dark earths on this site between the 11th and 15th century. It investigates whether they were the result of *in situ* formation during the use of this space; if sediments were (intentionally) deposited from elsewhere; how the relative thickness of the dark earths can be explained; whether it is possible to identify human activities and natural processes that have been masked by the current state of preservation of the dark earths; when market activities started on this site; what was happening before and whether specific features can be identified as 'typical' for these types of deposits. Botanical analyses were performed on the dark earths to provide information about the local vegetation at the site and to provide insight into the function of the site during the different periods.

3. Material and methods

Soil micromorphology combined with a phytolith study on thin sections and textural analyses on bulk samples were applied to evaluate the impact of the general depositional and post-depositional processes, to characterize the deposits between and underneath the three dark earths, to improve our understanding of the dark earth formation processes, and to identify and differentiate human activities and natural phenomena. The data were complemented with a study of macroscopic plant remains.

3.1 Field study

The southwestern section of profile 1bis of Lier Grote Markt was described and sampled for geoarchaeological analyses (Fig. 2). Field descriptions were made according to the “Comprehensive Field Data Bases” (Langohr, 1994) and the “Guidelines for soil profile description” (FAO, 2006) (Table 1).

3.2 Sampling

Twelve undisturbed blocks were taken from the soil profile (Fig. 2) for micromorphological and phytolith analysis. Prior to impregnation with resin, the 12 block samples were partly subsampled for granulometric analysis. Due to the quantity and preservation of the material, 16 bulk samples could be obtained.

3.3. Micromorphology

The undisturbed blocks were air-dried, impregnated with resin, and manufactured into thin sections (thickness ca. 30 µm) according to the standard procedures of the Laboratory for Mineralogy and Petrography, Ghent University. Observations were made with a petrological microscope under plain polarised light (PPL), between crossed polarisers (XPL) and with oblique incident light (OIL) at magnifications of 25, 100, 200, 400, 500 and 1000. The thin section descriptions follow the international nomenclature of the ‘Handbook for Soil Thin Section Description’ (Bullock et al., 1985) and the ‘Guidelines for Analysis and Description of Soil and Regolith Thin Sections’ (Stoops, 2003). The analysis also includes the semi-numerical quantification of certain features and components (Table 2).

3.4 Granulometric analyses of the fine soil fraction

After gentle crushing, the air-dried bulk-soil samples, subsamples of the oriented blocks, passed through a 2 mm wet sieve. The granulometry of the < 2 mm fraction of each bulk sample was determined through laser diffractometry using a Beckman Coulter LS 13 320 sediment particle size analyser according to the standard protocol of the Geochemistry and Petrophysics Laboratory, School of Geosciences, University of Abderdeen. Similarity indices (Comparative Particle Size Distribution index matrices, hereafter: S.I.) were calculated following Langohr et al., 1976.

3.5 Botanical studies (phytoliths, seeds and fruits)

The phytolith analysis of thin sections took place after the micromorphological study and involved several microscopy sessions with one of the micromorphologists (Y. Devos). It follows Devos et al. (2013b) and Vrydaghs et al. (2016). Based on the results of the micromorphological analysis two to three squares of 25 mm^2 (5x5 mm) per stratigraphic unit were selected. The phytolith analysis consists of a three-step approach, namely:

1. a systematic recording of the distribution patterns of the phytoliths;
2. their subsequent morphotypological analysis;
3. the counting of phytoliths within each distribution pattern in order to develop a semi-numerical approach.

The morphotypological analyses were carried out according to a revised version of Runge’s inventory (1999) (see Devos et al., 2013b). Naming of the phytoliths followed, whenever possible, the nomenclature of ICPN 1.0 (ICPN Working Group, 2005).

The three samples for macrobotanical analysis were taken from profile 1bis (samples 5291 and 5292) and profile 21 (sample 5232). These samples were passed through 0.5 mm and 0.25 mm sieves. The obtained fractions were analysed under a Zeiss stereomicroscope with a magnification of up to 50x. Identification of the macrofossils was based on Beijerinck (1947), Berggren (1969, 1981), Anderberg (1994), Körber-Grohne (1994) and Cappers et al. (2006).

4. Results

Detailed soil and sedimentary descriptions were produced in the field and are summarized in Table 1. A summary of the results of the micromorphological analysis of the thin sections can be found in Table 2. The S.I. matrix is set out in Table 3, while the botanical results are summarised in Table 4.

5. Interpretation and discussion

5.1 Site formation and post-depositional processes

The site's low-lying location near several watercourses suggests a permanent wet environment of the site, also supported by the botanical record (see section 5.2 below). Long periods of water saturation of the lowest part of the profile are reflected in the greyish (gleyed) colours and the presence of a fluctuating water table during excavation. This corresponds with the historical records of a rather low discharge in summer and regular flooding in winter (see Baten and Huybrechts, 2002). Hydrological changes, such as fluctuations of the water table and water saturation have also resulted in the redistribution of iron and phosphorus, which is clear from the secondary formation of pyrite, vivianite, iron nodules and root rust (Courty et al., 1989; Cammas, 1994).

The bioturbation in the thin sections of the dark earth was sometimes severe, and deposits were in some places up to 90-100% disturbed, although the severity of bioturbation was less in the uppermost deposits.

5.2 Occupation sequence

The sequence of units is presented chronologically, discussing the specific processes and activities that took place at the site in the location of profile 1bis from bottom to top.

5.2.1 Original sediments

The original sediments (unit MB) are composed of a succession of deposits dominated by unsorted silt to coarse sand-sized angular quartz. Its unsorted character and its angularity suggest it is not an aeolian deposit (see Goldberg and Macphail, 2006) and might thus point to a rather massive alluvial deposit. The very rare limpid coatings of oriented clay (Fig. 3a) indicate soil development under stable conditions (Fedoroff and Goldberg, 1982; Macphail et al., 1987). As distinct clay illuviation coatings cannot develop under water saturated conditions (Kaiser et al., 2006), this implies that this level has, at the moment of the formation of these clay coatings not been permanently water saturated. However, the presence of vivianite (Fig. 3b) and pyrite crystals indicates that at present rather strong reduction conditions prevail (Karkanas and Goldberg, 2010; Lindbo et al., 2010). This unit shows little or no evidence of direct anthropogenic activity. Microscopic fragments of organic matter are present in trace amounts and may be the result of past root activity.

5.2.2. *The oldest dark earth (11th-12th century AD)*

The Comparative Particle Size Distribution index matrix (S.I.-indices) indicates a very high textural similarity between the upper part of unit MB, unit 814 and unit 813. As they also share a similar mineral composition, units 814 and 813 result from the *in situ* transformation of MB, and do not represent a dump of new material. Its enrichment in organic matter (see Table 2), combined with the presence of microscopic traces of mesofaunal bioturbation (Fig. 3c) and root galleries suggests that units 813/814 are the remains of an ancient topsoil (Gerasimova and Lebedeva-Verba, 2010). The presence of crescent and layered dusty clay coatings (Fig. 3d) as well as coarser, silty coatings, indicate that the surface has been disturbed or was (temporarily) bare (Courty et al., 1989; Macphail et al., 1990; Carter and Davidson, 1998; Lewis, 2012).

The random distribution and the strong fragmentation of anthropogenic elements such as charcoal, pottery, and bone (Devos et al., 2009, 2013a; 2013b), in combination with a clear dominance of isolated phytoliths as well as the presence of some clusters (Devos et al., 2013b; 2016) (Fig. 4), the occurrence of broken phytoliths and a general increase in porosity (Table 2) suggest the physical mixing of this unit due to agricultural practices. The presence of differentially compacted zones as described by Lewis (2012) provides additional evidence for this practice. In this respect we also refer to a number of larger areas of very dark micromass with straight, sharp boundaries (i.e. Fig. 3e) at the top of unit 813, which are interpreted as potential implement marks (Lewis, 2012: 43-54).

Furthermore, the presence of randomly distributed waste (e.g. ceramics, charcoal, bone), an increase in fungal sclerotia) and the occurrence of molten silica possibly related to ashes, provides evidence for enhancement of the soil by manuring, including the deposition of household waste (Simpson et al., 1998; 2000; Devos et al., 2009; Lewis 2012). As we are dealing with initially poor sandy soils, the level of faunal turbation can be qualified as anomalously high, and indeed appears related to enhancement of the soil fertility (Goldberg and Macphail, 2006; Adderley et al., 2010; Lewis, 2012). Nutrient-rich conditions are also reflected by the occurrence of orache (*Atriplex patula/prostrata*) and curlytop knotweed (*Persicaria lapathifolia*) (Weeda et al., 1985), which could have grown here locally.

All these indicators establish sound evidence for the presence of cultivated fields. The occurrence of crop weeds such as sheep's sorrel (*Rumex acetosella*), dwarf nipplewort (*Arnoseris minima*), cornflower (*Centaurea cyanus*), annual knawel (*Scleranthus annuus*) and corn spurrey (*Spergula arvensis*) is also consistent with this hypothesis. However, no plant macroremains of cultivated crops were found in the botanical assemblage. This in itself is not uncommon, since the absence of specific macroremains has also been reported for other cultivated fields (see for example Devos et al., 2011).

During phytolith analysis, however, phytoliths deriving from cultivated crops were only observed as very rare (1.27% of the total grass phytolith record) and were limited to isolated phytoliths (dendritics *sensu* ICPN Working Group, 2005) (Fig. 5). No articulate dendritics were observed at all. This presents a stark contrast with previously identified cereal crop fields, where dendritics were always recorded along three distribution patterns, including the articulate pattern (see Devos et al., 2009; 2011; 2013a; 2013b; Vrydaghs et al. 2015, 2016). This suggests that the observed dendritics do not derive from previously articulated systems and as such, from plants growing *in situ*. In this context, they are probably related to the input of manure (Fig. 3f).

At the same time, seeds and capsules of flax (*Linum usitatissimum*) were recorded in the archeobotanical record, indicating that flax was processed in the wider area. In this respect, the question arises whether the absence of cereal markers in the botanical spectra can be explained by the cultivation of flax. This would suggest that the production of linen around Lier could be much older than the successful take-off of the textile market of Lier around the third quarter of the 13th century.

5.2.3 Dark earth 2 (final quarter 12th century)

A significant and abrupt change of activities can be observed. A clear textural discontinuity exists between the second dark earth (unit 725) and unit 813, as demonstrated by the low similarity indices in the particle-size analysis (Table 3). This suggests the truncation of unit 813 followed by the deposition of new sediments.
A strong human impact is reflected in the presence of a series of anthropogenic materials:

- Construction debris: fragments of limestone (Fig. 6a). The presence of compact “soil fragments” could also be related to earth-based construction materials (Devos et al., 2009).
- Hearth rake-out: wood ash and peat ash.
- Plant residues: the occurrence of partly decomposed plant fragments with articulated phytoliths. The resulting wave pattern of the intercellular spaces typical for cereals (Ball et al., in press; Rosen, 1992) establishes the presence of by-products of cereal processing (chaff) (Fig. 6b). Additionally, in combination with woody fragments and leaves (Fig. 6c), these remains might have been used as fodder (Deforce and Bastiaens, 2004) or as a kind of absorbing surface cover.
- Artisanal waste: a few leather fragments were recovered during the excavation. The amounts of vitrified ash (Fig. 6d) visible in thin section and the macroscopic finds of metal slag suggest nearby metalworking.
- Household/cooking waste as witnessed by the combination of seeds (Fig. 6e), shell, (burned) bone, ceramics, etc. The related botanical samples contain only one carbonised cereal grain.

Whether or not this deposit accumulated *in situ* gradually or was deposited (e.g. as part of a midden) is difficult to ascertain, since most of its components have been strongly mixed by rooting and mesofaunal activity (Fig. 6f).

Evidence for this is the presence of fine to coarse sand-sized tailed conoid excrements pointing to *Julidae* and/or *Glomeridae*, very fine sand-sized bacillo cylinders pointing to enchytraeids and/or Orbatid mites and coarse to very coarse sand-sized mammilated excrements pointing to earthworm activity (Stoops, 2003). However, at the base and in the upper part locally some planar voids (Fig. 7a) and a preferential horizontal orientation of components were observed. These characteristics are suggestive of a gradual accumulation of materials *in situ* (Milek 2012), combined with trampling due to frequent human or animal traffic (Gebhardt and Langohr, 1999). This is also suggested by the presence of plant remains typical of heavily trodden places, such as common knotgrass (*Polygonum aviculare*). The strong bioturbation, in combination with the presence of weathered anthropogenic remains like bone, shell, limestone and pottery fragments suggests an open, outdoor surface, allowing the weathering of these components to take place (Cammas, 1994). The presence of dusty clay coatings is consistent with the interpretation of this surface as having been (temporarily) unprotected (Courty et al., 1989; Macphail et al., 1990; Carter and Davidson, 1998; Lewis, 2012).

The incorporation of different kinds of materials into the unit may be related to a kind of early market activity. This could be a periodic event, where one has to imagine that at the end of a market lots of waste would remain lying around, including plant remains (seeds, chaff, etc.). Due to trampling these would easily get mixed with a sandy/silty sedimentary matrix. The more compacted, structured lenses could be related to a more intense use, for instance at the beginning and the end of episodes of market use. Due to the repetitive character of the activities the layer got progressively thicker. Evidence from the ceramics suggests that this unit was formed over the course of ca. 20-40 years. The presence of materials originating from different origins (like household waste and building debris) reflects a variety of (urban) activities taking place in the immediate surroundings. Grassland plants, buttercup (*Ranunculus*) and common selfheal (*Prunella vulgaris*) could reflect the presence of, potentially seasonal, grassy vegetation at the market place. This is also suggested by the observation of *in situ* roots (Fig. 7b).

The site's wetness is suggested by the preservation state of the organic remains, as well as by the presence of vivianite and pyrite (Fig. 7c). This implies that the general water level in the area was probably relatively high. This is not uncommon. In Bruges, for instance, the Grote Markt started out as a wet, muddy wasteland (an old meadow or hayland on an outcrop), which was elevated by waste deposits. These comprised both the waste of the expected "market" activities as the elevation with organic waste and building debris. The latter may have come from the demolition of older buildings of the 11th-century fortification phase or from construction works on important buildings in the town, such as the St-Peterschapel or the St-Gummarus church in the 13th century (Ryckaert, 2011; Verhulst, 1999).

Compared to the scarce occurrence of fruit remains in the first dark earth, there is a clear increase in the amount of fruit species encountered in this layer (botanical sample 5291). In addition to wild strawberry (*Fragaria vesca*) and blackberry (*Rubus*), fruit species are now also represented by the remains of fig (*Ficus caria*), cherry (*Prunus avium*), apple or pear (*Malus domesticus/Pyrus communis*; the pips of which are difficult to distinguish) and elderberry (*Sambucus nigra*). The abundance of these species may well be attributed to the area's new function as a market place. These food crops could have been brought from nearby hinterland, or further away, with the intention of trade. Other edible plants that have been recorded include walnut (*Juglans regia*), hazelnut (*Corylus avellana*) and celery seed (*Apium graveolens*), the latter being commonly used as a kitchen herb. In addition, lamb's quarters (*Chenopodium album*), black bindweed (*Fallopia convolvulus*), curlytop knotweed (*Persicaria lapathifolia)* and black nightshade (*Solanum nigrum*) grow on nutrient-rich soils. As these species often occur as weeds between crops (Weeda et al., 1988; 1985), they could have been brought in with food crops.

5.2.4 Units 745, 749 & 748 separating dark earths 2 and 3

An abrupt boundary is evident between units 725 and 745/749 - 748. The latter are compact heterogeneous units composed of 'clean' silty to sandy sediments reminiscent of the original sediments, dusty humus rich aggregates composed of unsorted coarse silt and sand, aggregates originating from unit 725, and building debris. As the individual aggregates are still easily identifiable, a rapid accumulation of these units seems probable, giving less opportunity for the different fabrics to be homogenised by bioturbation.

The building material is composed of lime-based building materials (mortar and limestone) as well as earth-based building materials such as daub (dense aggregates mainly composed of silt and very fine sand). The input of building materials may be indicative of a rather intense building activity in the immediate surroundings. This relatively massive deposit of debris and soil material appears to have been spread for levelling or preparation of a new soil surface.

5.2.5 Dark earth 3 (second quarter of the 14th century)

The third, uppermost dark earth encountered on the site consists of 5 subunits (top to bottom: respectively a-e) based on slight changes in fabric and inclusions. In the top ca. 1 cm of every subunit, there is a poorly developed platy microstructure and a preferential horizontal orientation of elongated components, suggesting a gradual and repeated accumulation of debris on the surface, which was frequently trampled (Gé et al., 1993). The preservation of the microstratigraphy suggests also a relatively high intensity of traffic on the site, leaving relatively little time for complete mixing by roots and earthworms (Milek, 2012).
Overall, the entire unit 720 is characterised by a significant increase of anthropogenic inclusions compared to the lower-lying units, including inclusions that were not identified in lower-lying units such as metal derived

from ironworking, or glazed pottery (Fig. 7d). Again, materials from several origins have been identified:

- Construction debris: dense soil fragments, limestone, mortar and daub.
- Hearth rake-out: wood ash and peat ash.
- Artisanal waste as witnessed by the combined presence of vitrified ash, leather, hammerscale (Fig. 8a), slag (Fig. 8b-c), and fuel waste such as charred peat.
- Household/cooking waste, including shell, bone, (burnt) fish bone, eggshell, ceramics, etc.
- Plant residues: as in the second dark earth, partly decomposed plant fragments with articulated phytoliths have been observed. The resulting wave pattern of the intercellular spaces typical for cereals establishes the presence of by-products of cereal processing (chaff). Additionally, in combination with woody fragments and leaves, these remains might have been used as fodder (Deforce and Bastiaens, 2004) or as a kind of surface cover.

This abundance of materials from different origins, including some metalworking waste, is comparable with the 13th century New Market area in Magdeburg (Macphail 2007: 312), even though on the latter a much larger component of metal waste, attributed to bronze bell casting, was found.

In the top two subunits (720a and 720b), there is an abundance of horizontally oriented leaves. It is possible that these were strewn on the ground surface intentionally and/or were a result of activities that occurred on site (Milek and French, 2012) and that the layers of leaves represent small single events of deposition and trampling (Fig. 8d). At the top of the dark earth, coatings and aggregates of finer micromass resembling topsoil surround anthropogenic inclusions such as charred peat, pottery and organic matter fragments, often resulting in a (sub-)rounded appearance, thus suggesting that the fragments were lying on the surface and were gradually trampled into it (Fig. 8e)(Matthews et al., 1997).

The evidence is consistent with a market surface, as attested by the written and other archaeological sources. It is remarkable that this intensively used third dark earth seems to have originated exactly in the same period in which the town takes over the market infrastructure from the Duke.

It seems impossible to distinguish a change in activities between the different subunits of 720. Small differences in inclusions may be due do coincidental artefact distribution instead of significant activity change. One possible explanation for the compacted and platy character of the top of each subunit is a form of differential accumulation, for instance due to seasonality, where accumulation and trampling of material would be greater at times when the market was being used more intensively, with increased bioturbation occurring during times of less intense traffic and surface use.

The spike in the amount of charred peat, charcoal and fish bone in the very top of the dark earth may be due to an increase in waste that was left on the market surface right before it was covered by the thick, sandy levelling layer 131bis (see section 5.2.6). Additionally, a significant anomaly is discernible in the upper part of unit 720. Dusty clay-silt coatings indicate a disturbed surface (Courty et al., 1989; Macphail et al., 1990; Carter and Davidson, 1998; Lewis, 2012). In combination with the presence of polyconcave voids (Fig. 8f) that indicate structural collapse (Stoops, 2003, Macphail, et al., 2010) and a significantly higher concentration of sponge spicules (Fig. 8g; Fig. 9) compared to the other studied units, this can be attributed to the flooding of the area.

At the very top of 720a, the fabric is more compacted and a crust of phosphate and iron has formed along the boundary between 720a and 131bis, a feature typical for compacted deposits causing inhibited drainage (Herbauts et al., 1998; Simpson et al., 1999). This feature indicates that unit 131bis has been thoroughly compressed (see below).

The abundance of building material fragments in unit 720 suggests that market stalls may have stood there on a semi-permanent basis, for example in wooden constructions covered with daub. This practice is also attested by the written sources, which mention that the predecessor of the prestigious cloth hall of 1367 was a wooden shed (Breugelmans et al., 1990).

5.2.6 Sand cover (second half of the 14th century at earliest)

This sandy layer is composed of unsorted fine to coarse sand-sized grains, with dominant quartz. A clear textural discontinuity can be observed between the upper dark earth (unit 720) and unit 131bis, as demonstrated by the low similarity indices (Table 3) and a markedly higher amount of glauconite (Table 2). Apart from trace amounts of organic matter, no anthropogenic inclusions are present. This layer is interpreted as a thick, homogenous, sandy levelling/preparation layer brought in from elsewhere and deposited in one, or in very few episodes (as far as can be distinguished based on the amount of unit 131bis in this thin section). Its low porosity, in combination with the presence of a continuous iron crust at the base of the unit and the abundant presence of iron nodules in the top of unit 720a, indicates that these sediments have been thoroughly compressed.
This sand cover was clearly the preparation layer for the first cobbled/paved market place that was developed together with the Belfry and stone cloth hall around 1367 (Breugelmans et al., 1990).

6. Conclusions

The integration of micromorphological and archaeobotanical data has provided evidence for the following sequence of activities at the Grote Markt in Lier:

Before the formation of the second dark earth (unit 725), dated to around the final quarter of the 12th century, agricultural activities appear to have taken place at the site including manuring with (household) waste, possibly resulting in a speedier raising of the soil thickness of the first dark earth (units 813/814).

Evidence suggests that flax may already have been produced or handled in the area, almost a century before the attested successful take-off of the textile market of Lier in the third quarter of the 13th century.

The use of the area of the Grote Markt as a rural meadow during the 11th century coincides with the period in which Lier only very slowly developed from a general central place with mainly religious and (local) political functions towards an urban entity. The wet wasteland, which appears to have been the property of the Duke of Brabant, was gradually used more and more intensively as a kind of open area or common on which different communal activities took place from the (late) 12th century onwards. The textural discontinuity between dark earths 1 and 2 does suggest a deliberate preparation of the surface comprising a significant truncation of the agricultural unit, followed by a deposition of new sediments, perhaps illustrating a conscious episode of urban planning with a conceptual transformation from rural to urban space. This is indicated by the fragments of building materials, fuel ash residues, pottery, bone, vitrified ash and abundant organic matter that accumulated here. How exactly this space was used remains open to discussion, but taking into account the similarities to dark earth 3, which certainly accumulated in the context of a market space, and the macroscopic finds from this unit, it seems possible that the second dark earth formed as a result of some type of market activity as well. Similarities with the macroscopic finds from the Grote Markt of Bruges point in the same direction. Complex post-depositional processes, including bioturbation, have obscured the original activities, but the presence of a wide variety of materials indicates an organic, multifunctional and potentially chaotic use of the public space: artisanal activities involving fire installations, trade, traffic causing trampling, potential food preparation, waste accumulation, etc. Interesting to note is the possibility of peat being used as fuel. It seems that at this point in time, the urban life as well as the urban fabric of Lier were developing quite intensely, at which time the market area was transformed from a wasteland into a muddy and ‘dirty’ open area inside the town, still affected by generally wet conditions.

The units containing debris, building and soil material separating dark earths 2 and 3 could be related to local infilling of uneven surfaces or sporadic levelling episodes while the market was in use and changing. It seems that these were part of a gradual surface accumulation, possibly interlinked with stone building activity around the place, mixed with layers containing more abundant traces of occupation and market activity.

It is only from the early 14th century onwards that a structural transformation of the area into an intensively used communal open area took place. Even though the physical shape of the market place at this time is uncertain, it was clearly used as a designated and delimited forum for the producers and traders of Lier. This intensification of the use of this space coincides remarkably with the moment when the town took over the responsibility of the market infrastructure from the Duchy. This would indicate that the town made a deliberate choice to shift the activities from separate trade halls towards the more communal market area. During the first half of the 14th century the market place of Lier became a meeting space where intensive trade and craft activities had a prominent place, and where the material infrastructure of the square was a less important aspect than its functionality. The range of activities detected in thin section suggests that the prestige of a central market like the "Grote Markt" of Lier may be different from what has been interpreted from contemporary historical and art historical sources. Based on integrated excavation, archaeobotanical, and geoarchaeological evidence, which provides information about how space was used on a daily basis, the market place can be conceived as a space that was used on an intensive basis for a wide range of purposes, leaving behind waste material, housing market stalls and seemingly without inhibitions towards activities that require the use of fire. The fact that wet conditions remained active is indicated by the traces of flooding of this area found in the upper part of dark earth 3.

The surface of the market was maintained with sandy levelling episodes and may have been intentionally covered with organic material and/or hearth waste, but there seems no evidence for the kept, empty, cobbled, spacious prestigious place that is depicted in later art work, at least not before the thick unit of levelling sand (131bis) was deposited and the market was paved with stone. Only with this final addition of the sand layer, possibly related to the building of the new cloth hall in 1367, does the market area become fully 'urbanized', and starts to play its role as the symbolic forum for Lier's own urban identity, and as a marker of its success.

The micromorphological study presented here offers a reference for the material record typically found in a market place, characterized by a remarkable mix of waste materials from different sources. As well as presenting deposits typical of unpaved medieval market places in a continental European climate, it characterizes the sequence of activities predating market formation. Micromorphology thus offers complementary evidence to written sources and provides crucial information for the understanding of the origin and identity of the urban fabric of late medieval towns. In this case it illustrated the delicate and nuanced transformation of the sense of place of this remarkable market place between the 11th and the 14th century.

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Tables

Table 1: Field descriptions of the stratigraphical units of profile 1bis shown in figure 2.

Depth (upper boundary)	Unit	Colour (dry), texture, boundary	Inclusions
6,75 m taw	131bis	white (2.5Y 8/2), sand, heterogeneous, abrupt, slightly wavy lower boundary	Limestone fragments, few small brick fragments, charcoal
6,70 m taw	720 dark earth 3	SU 720a : olive gray to olive (5Y 5/2 to 3), loam, homogeneous, humic, clear, wavy lower boundary SU 720b : light brownish gray (2.5Y 6/2), loam, homogeneous, humic, clear slightly wavy lower boundary SU 720c : dark gray (5Y 4/1), loam, homogeneous, humic, clear slightly wavy lower boundary SU 720d : dark grayish brown (2.5Y 4/2), loam, homogeneous, humic, clear slightly wavy lower boundary SU 720e : gray to dark gray (2.5Y 3 to 4/1), sandy loam, homogeneous, humic, abrupt slightly wavy lower boundary	720a: few brick fragments, few small mortar fragments 720b-e: few brick fragments, abundant mortar fragments; relatively abundant charcoal
6,43 m taw	748	very dark to dark gray (2.5Y 3 to 4/1), sandy loam, containing olive gray to light olive gray (5Y 5 to 6/2) sandy and loamy inclusions	relatively abundant charcoal, few limestone fragments, few shell fragments (mussel)
6,37 m taw	749	light olive gray to light gray (5Y 6 to 7/2), fine sand, heterogeneous, clear to gradual wavy lower boundary	few charcoal fragments
6,30 m taw	745	grayish brown to light brownish gray (2.5Y 5 to 6/2), heterogeneous, mixture of sandy loam and sand, abrupt, smooth to slightly wavy lower boundary	/
6,27 m taw	725 dark earth 2	dark gray to very dark greyish brown (10YR 4/1 to 2.5Y 3/2), light sandy loam, humic, abrupt smooth lower boundary	relatively few brick fragments, relatively few charcoal fragments, very few burnt daub fragments, very few wood fragments, abundant organic matter
5,94 m taw	813 dark earth 1	gray (5Y 5 to 6/1), fine sand, abrupt to clear, wavy lower boundary	relatively few charcoal fragments
5,71 m taw	814 dark earth 1	light brownish gray (2.5Y 5 to 6/2), fine sand, clear to gradual wavy lower boundary	Fe-concretions, very few charcoal fragments
ca. 5,55 m taw	MB (substrate)	gray to light gray (5Y 6 to 7/1) fine sand	/

Table 2: Summary of the micromorphological observations per stratigraphic unit.

SU	Microstructure and porosity	Groundmass	Organic material	Anthropogenic material	Pedofeatures
131 bis	Massive, weakly developed platy, ca. 5% macropores	Coarse monic to chitonic, locally close porphyric fine to coarse sand quartz and glauconite, yellow, limpid micromass	Trace organic fine material	/	Rare limpid clay coatings, rare vivianite crystals, rare iron nodules
720 a-e	Channel to weakly developed platy, ca. 10-15 % macropores	Close porphyric, dominant silt to medium sand sized quartz; dotted micromass	Wood, leaves, chaff, peat fragments, organic fine material, fungal sclerotia	Pottery, shell, eggshell, bone, fish bone, daub, hammerscale, metal slag, leather, limestone, mortar, charred seeds, charcoal, charred peat	Rare vivianite crystal intergrowths, iron nodules (concentration of iron coatings in the top)
745 – 749 – 748	Massive to weakly developed subangular blocky, ca. 10-15 % macropores	Mixture of coarse monic to enaulic and close porphyric, dominant silt to medium sand sized quartz; yellow to reddish brown, dotted micromass mixed with a cleaner yellow, speckled micromass	Wood, leaves, tissue fragments organic fine material, peat fragments trace fungal sclerotia	pottery, daub, bone, vitrified ash, shell, eggshell, charcoal, charred peat, limestone, hammerscale	Dusty clay coatings trace iron nodules and iron pseudomorphs of plant tissue, vivianite and pyrite crystal intergrowths
725	Weakly subangular blocky to channel, ca. 10-15% macropores	Close porphyric, dominant silt to medium sand sized quartz; orange brown to black, dotted, humic micromass	Leaves, seeds, chaff, wood, roots, fresh peat fragments, tissue fragme nts, organic fine material, trace fungal sclerotia	Shell, pottery, bone, vitrified ash, limestone, daub, charcoal, peat ash, charred seeds	Dusty clay coatings, rare iron nodules and hypocoatings, rare iron pseudomorphs, vivianite and pyrite crystal intergrowths, rare vivianite channel infillings, tailed conoid excrements, bacillo-cylinders, organo-mineral excremental aggregates
813 - 814	Weakly developed subangular blocky, channel, 10-15% planar voids and channels	Enaulic, locally close porphyric, dominant unsorted silt to medium sand quartz; orange brown, dotted, humic micromass	Peat fragments, organic fine material, trace fungal sclerotia	Pottery, shell, bone, daub and vitrified ash, charcoal	Dusty clay and silt coatings, iron nodules, coatings and hypocoatings, vivianite and pyrite crystal intergrowths, organo-mineral excremental aggregates
MB	Massive to poorly developed	Coarse monic, locally chitonic; dominant	Organic fine material	/	Limpid clay coatings and infillings; layered limpid clay-silt coatings, iron

	subangular blocky, < 5% planar voids and channels	unsorted silt to medium sand quartz; yellow to orange, limpid clay			nodules, coatings and hypocoatings, vivianite crystal intergrowths, rare pyrite

Table 3: Similarity indices of the < 2mm fraction of all samples. In the case of thick layers, multiple samples (up to three) were taken at different depths. The units are ordered from bottom to top of the profile from left to right on the x-axis, from top to bottom on the y-axis.

			Dark earth 1				***Dark earth 2***						***Dark earth 3***			
SU	***MB***	***MB***	***814***	***814***	***813***	***813***	***725***	***725***	***725***	***745***	***749***	***748***	***720e***	***720d***	***720a***	***131bis***
MB	100	77	77	77	77	77	68	74	68	65	65	65	65	65	65	52
MB		100	92	87	87	87	73	83	73	69	69	69	69	68	68	54
814			100	93	93	93	73	83	73	69	69	69	69	68	68	54
814				100	98	96	75	86	75	70	70	70	70	70	70	54
813					100	95	76	86	76	70	70	70	70	70	70	54
813						100	73	84	73	69	69	69	69	68	68	54
725							100	87	94	78	77	77	77	76	75	55
725								100	87	78	77	77	77	76	75	55
725									100	84	82	80	80	78	77	57
745										100	94	86	86	83	77	57
749											100	91	90	86	81	57
748												100	99	95	89	57
720e													100	95	89	57
720d														100	94	57
720a															100	57
131bis																100

Table 4: Quantification of the botanical remain. (abbreviations: car=caryopsis (grain); f=fruit; s=seed; st=stone from drupe); scl=fungal sclerotia

		Sample	5291	5292	5232
		Context	Dark earth 2	Dark earth 1	Dark earth 1
		Plant part			
Cereals					
Cerealia indet.	Cereals	car	1		
Herbs					
Apium graveolens	Celery	f	1		
Oleaginous plants					
Linum usitatissimum	Flax	f	5	10	35
Linum usitatissimum	Flax	s	70	15	
Papaver somniferum	Opium poppy	s	2		
Nuts					
Corylus avellana	Haselnut	f	1		
Juglans regia	Walnut	f	12		
Fruit species					
Ficus carica	Fig	f	15		

Fragaria vesca	Wild strawberry	f	15	1	
Malus domesticus	Apple	st	2		
Prunus avium	Sweet cherry	st	1		
Prunus sp.	Plum	st	1		
Rubus fruticosus	Blackberry	st	80	3	
Sambucus nigra	Black elderbery	st	7		
Fields/gardens					
Arnoseris minima	Dwarf nipplewort	f		1	
Atriplex patula/prostrata	Common/spear-leaved orache	f		5	1
Centaurea cyanus	Corn flower	f	1		1
Chenopodium album	Lamb's quarters	f	10		
Euphorbia helioscopia	Sun spurge	f		1	1
Fallopia convolvulus	Black bindweed	f	10		
Galeopsis bifida/speciosa/tetrahit	Bifid/large-flowered/common hemp-nettle	f	2	1	
Montia minor	Klein bronkruid	s	1		
Persicaria sp.	Smartweed	f	5		
Persicaria lapathifolia	Curlytop knotweed	f	30	4	4
Rumex acetosella	Sheep's sorrel	f		10	
Rumex acetosella	Sheep's sorrel	f + perianth	25		
Scleranthus annuus	Annual knawel	f + perianth	6	1	
Solanum nigrum	Black nightshade	s	10	1	
Sonchus asper	Prickly sow-thistle	f	1		
Spergula arvensis	Corn spurrey	s	5	1	
Stellaria media	Chickweed	s	5		
Thlaspi arvense	Field penny-cress	s	1		
Urtica urens	Annual nettle	f	2		
Ruderal species					
Anthemis cotula	Stinking chamomile	f	2		
Conium maculatum	Poison hemlock	f	1		
Galium aparine	Cleavers	f	1		
Polygonum aviculare	Common knotgrass	f	10	3	
Rumex crispus type	Curly dock type	f		2	
Grassland					
Agrimonia eupatoria	Common agrimony	f	2		
Leontodon autumnalis	Autumn hawkbit	f	2		
Poaceae indet.	Grassen	f	2		
Prunella vulgaris	Common self-heal	f	5		
Ranunculus acris/repens	Meadow/creeping buttercup	f	35	1	
Ranunculus flammula	Lesser spearwort	f	5		2
Rumex crispus type	Curly dock type	f	3	2	
Silene flos-cuculi	Ragged robin	s		10	
Heather/peat					
Cenococcum geophilum		scl		x	
Wetland thickets					
Alnus glutinosa	Common alder	f	2		

Riparian vegetation					
Bolboschoenus maritimus	Sea clubrush	f		1	
Carex curta-type	White sedge		5		
Carex hirta /riparia type	Hairy/greater pond sedge	f		2	
Carex otrubae/vulpina type	False/true fox sedge	f	1		
Eleocharis palustris/uniglumis type	Common/slender spikerush	f	25	12	2
Glyceria fluitans	Floating sweet-grass	f	2		
Juncus sp.	Rush	s		2	
Lycopus europaeus	Gypsywort	f	2		
Mentha aquatica/arvensis	Water/field mint	f	1		
Myosotis sp.	Forget-me-nots	f	1		
Oenanthe aquatica	Fine-leaved water-dropwort	f	3		
Persicaria hydropiper	Water-pepper	f	1		
Persicaria minor	Small water-pepper	f	1		
Ranunculus sceleratus	Cursed buttercup	f	6	2	3
Urtica dioica	Common nettle	f	1		
Various					
Indeterminatae	Unknown	f/s	2		

Figure captions

Fig. 1a: Geographical situation and layout of the town Lier, with the location of the site projected on the Atlas Ferraris (1771-1778) (this map can be consulted integrally online at http://www.kbr.be/collections/cart_plan/ferraris/ferraris_nl.html).

Fig. 1b: Location of profile 1bis on the Grote Markt in Lier, with the full extent of the excavation marked by the rectangle.

Fig. 2: Profile 1bis showing the stratigraphical units and location of block samples. Unit 813 corresponds to oldest dark earth 1, unit 725 to dark earth 2 and unit 720 to dark earth 3.

Fig. 3a: Limpid clay coatings of oriented clay (green arrows) indicating soil development under stable conditions (unit MB, XPL).

Fig. 3b: Vivianite neoformation (green arrows) as a result of relatively strong reduction conditions (unit MB, PPL).

Fig. 3c: Fabric pedofeature probably related to earthworm activity. Note the presence of a coating of fine soil material on the channel walls (see Kooistra and Pulleman, 2010) (Unit 814/813, PPL).

Fig. 3d: Dusty layered clay coating (Unit 814/813, PPL) indicating an unprotected surface.

Fig. 3e: Very dark brown to black fine organic matter mixed in with the original fabric. Note the sharp boundary between the two fabrics (yellow arrows), which could potentially be an implement mark (Unit 814/813, PPL).

Fig. 3f: Isolated dendritic phytolith. This marker typically derives from cultivated cereals (Rosen, 1992; Vrydaghs et al., in press). This phytolith, being isolated, points to the disarticulation of previously articulated material, either before or after its incorporation within the studied unit (Unit 814/813, PPL).

Fig. 4: Frequencies (in %) of the basic distribution patterns of the phytoliths within Unit 813. ISO: Isolate; CLU: Cluster (for a definition of these basic patterns, see Vrydaghs et al., in press). Note the very strong dominance of the isolate pattern, as well as a total absence of articulated material. This picture is in clear agreement with a reworking of the unit.

Fig. 5: Composition of the phytolith assemblage of the basic distribution pattern of Unit 813 according to a revised version of Runge (1999 A: Elongated phytoliths A1: Elongate with a circular cross section; A3: Elongate with edges, not circular in cross section; A7: Other elongate phytoliths G: phytoliths markers for grasses. G1.1: Trapeziforms; G1.2: Lobate; G3.2: Appendage phytoliths; G4.1: Redundant phytoliths; G5: Dendriforms. Phytolith markers for cultivated cereals (dendritics *sensu* ICPN Working Group, 2005)

are labelled as G5c. The latter are only recorded for the isolated basic distribution pattern and with a very low frequency (1,27% of the total Isolate grasses phytoliths). NI: Morphologically non-identified phytoliths.

Fig. 6a: Intrusive limestone fragment interpreted as construction/destruction debris. Note the presence of fossil foraminifera (f) (Unit 725, PPL).

Fig. 6b: Husk fragment containing articulated cereal phytoliths. Their very precise anatomical distribution suggests the incorporation of the by-products of cereal processing within the studied dark unit (Unit 725, PPL).

Fig. 6c: Humified leaf remains (Unit 725, PPL).

Fig. 6d: Vitrified ash suggestive of high temperature heating (Unit 725, PPL).

Fig 6e: Seed (Unit 725, PPL).

Fig. 6f: Excremental aggregates pointing to mesofaunal activity (green arrows). The excrements are mainly composed of tissue residues, organic fine material and a limited mineral content (Unit 725, PPL).

Fig. 7a: Planar voids pointing to soil compaction, possibly due to trampling (Unit 725, PPL).

Fig. 7b: *In situ* root. Note the presence of vivianite (blue arrow) (Unit 725, PPL).

Fig. 7c: Vivianite (red arrows) and pyrite (green arrows) formation as a result of rather strong reduction conditions (Unit 725, PPL).

Fig. 7d: Fragment of glazed pottery with clearly distinguishable dark red pottery fabric (p) and yellow glaze (g) (Unit 720, PPL).

Fig 8a: Fragment of metal slag (Unit 720, PPL).

Fig. 8b: Fragment of metal slag (Unit 720, XPL).

Fig. 8c: Fragment of charred peat (Unit 720, PPL).

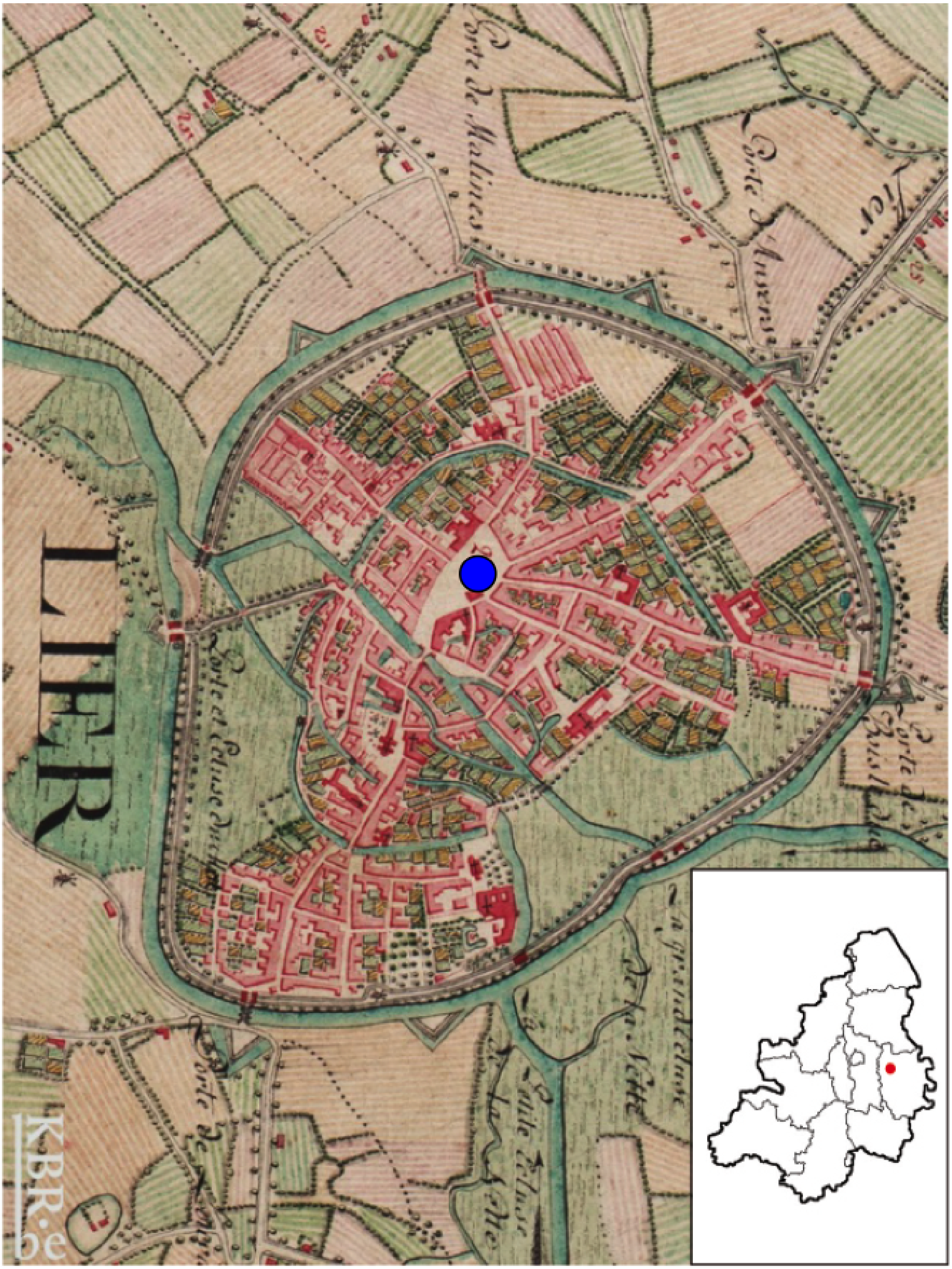
Fig. 8d: Succession of horizontally oriented plant remains (blue arrows). Note the presence of amorphous vivianite (red arrows) (PPL).

Fig. 8e: Charcoal embedded within a rounded aggregate. The occurrence and orientation of such rounded aggregates within this unit suggests they have been trampled in (Unit 720, PPL).

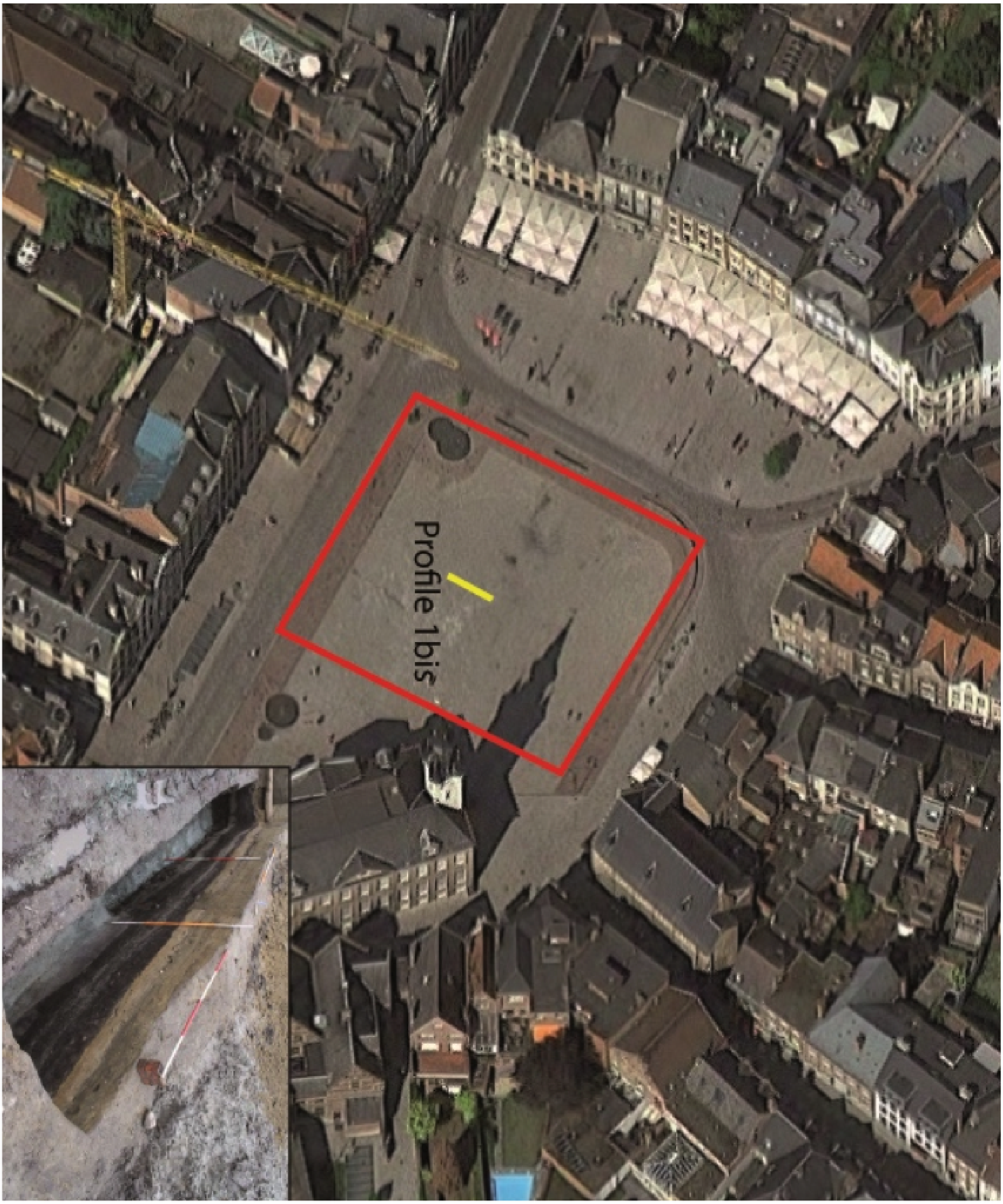
Fig. 8f: Soil slaking as a result of flooding (Unit 720, PPL).

Fig. 8g: Sponge spicules (blue arrows) (Unit 720, PPL).

Fig. 9: Graph showing the sponge spicule count per stratigraphic unit. Note the markedly elevated number of sponge spicules in the upper part of unit 720 (720a).



LIER
Porte de Malines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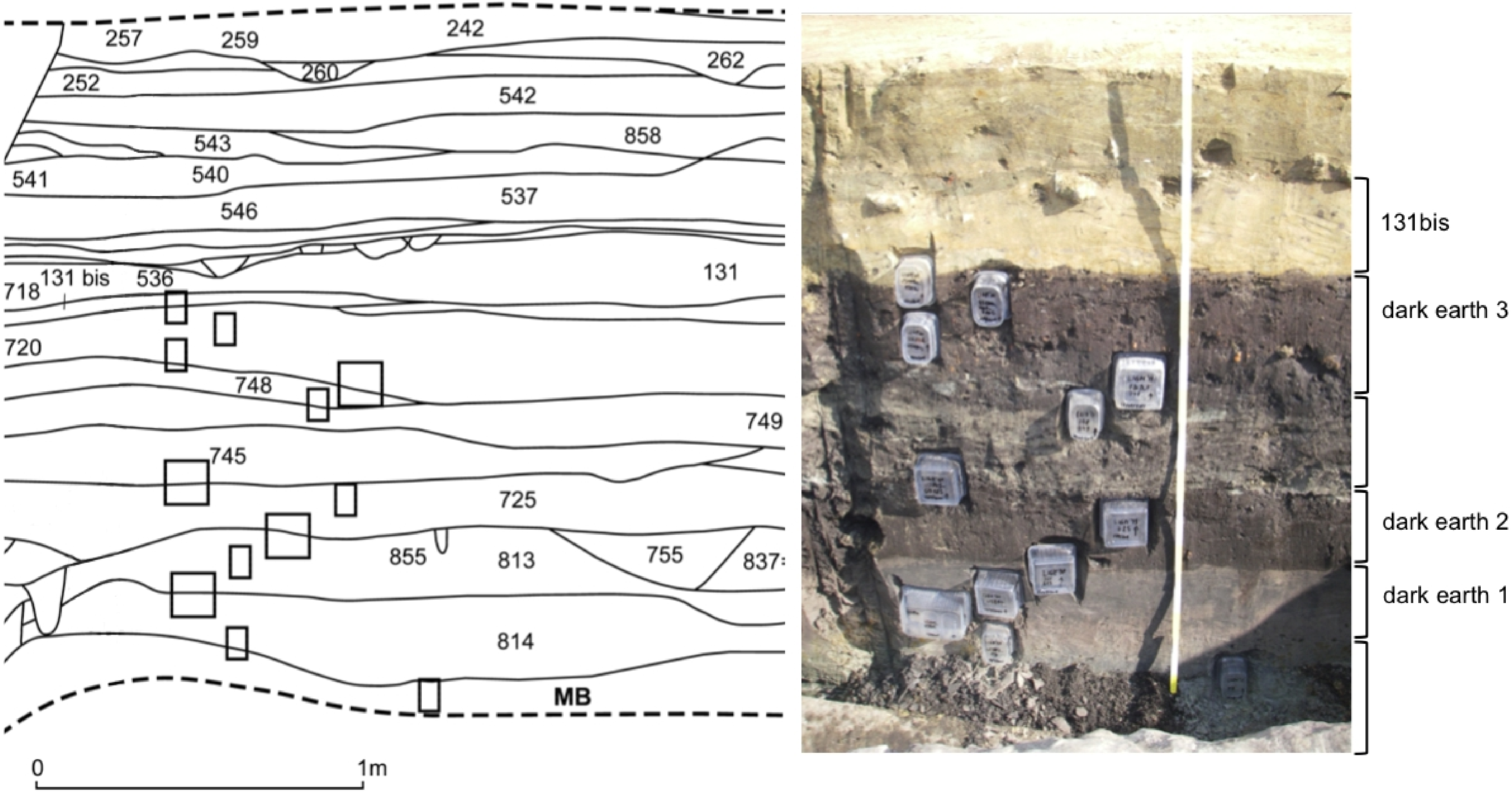
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1m
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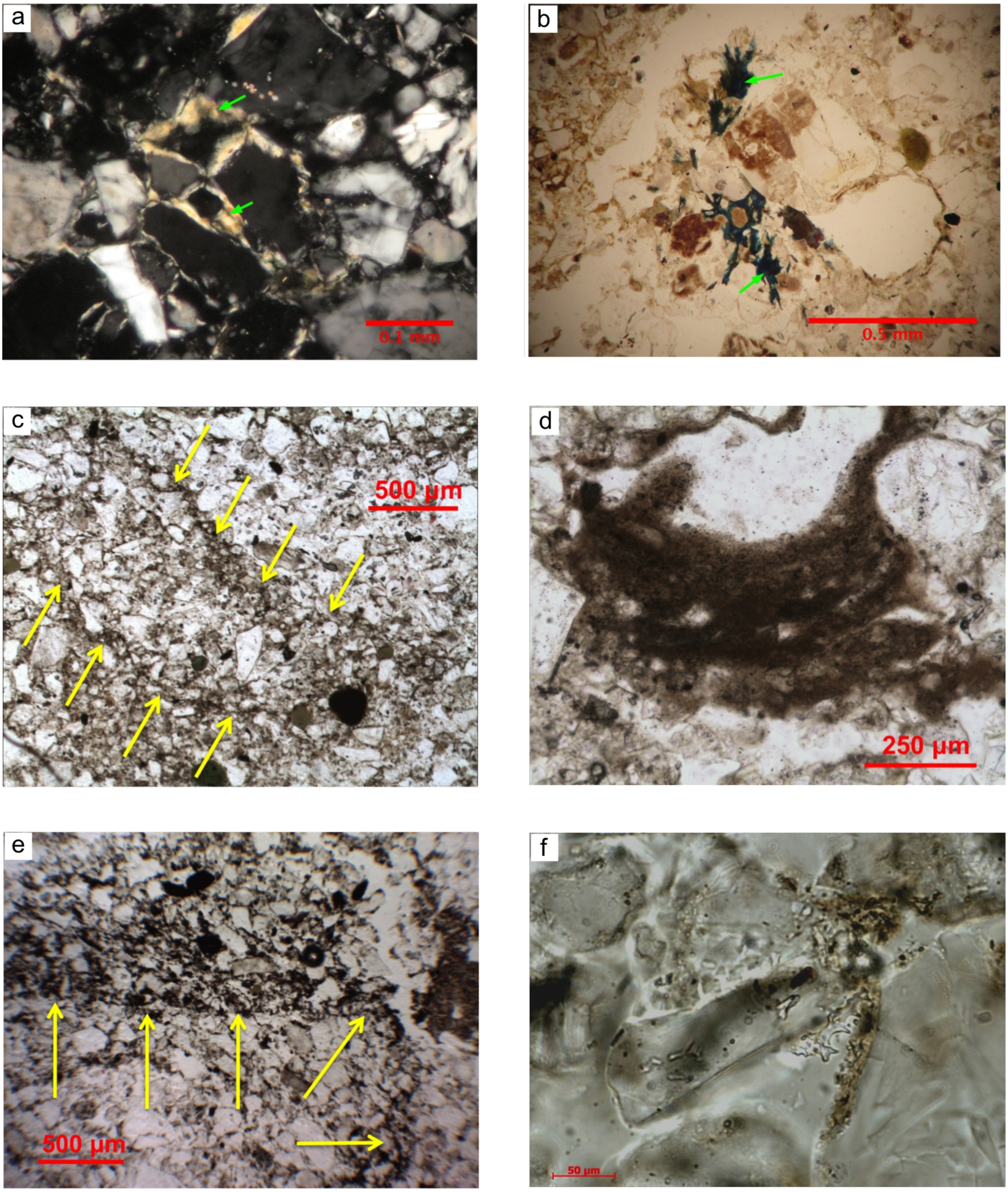
dark earth 3
dark earth 2
dark earth 1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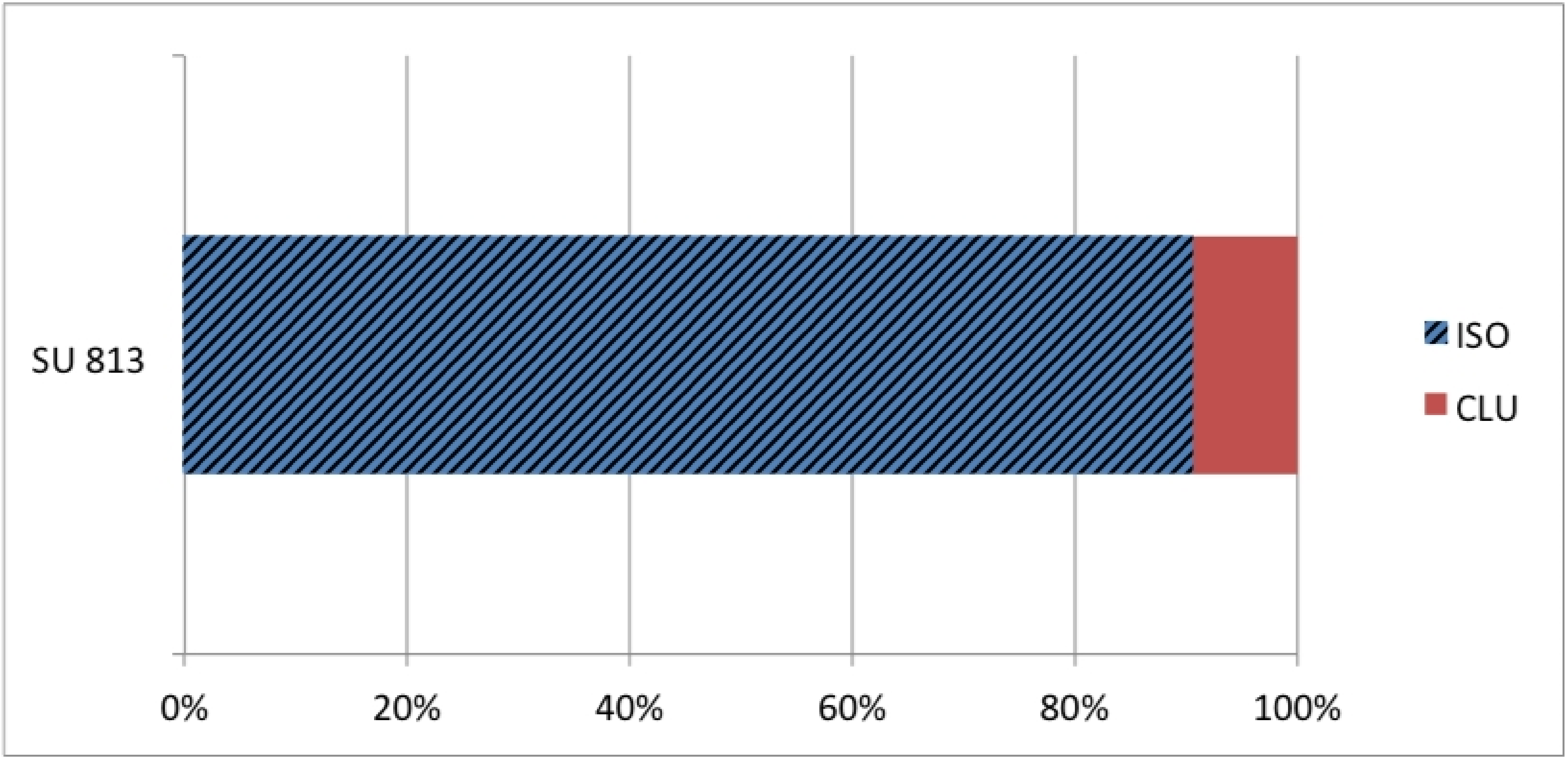
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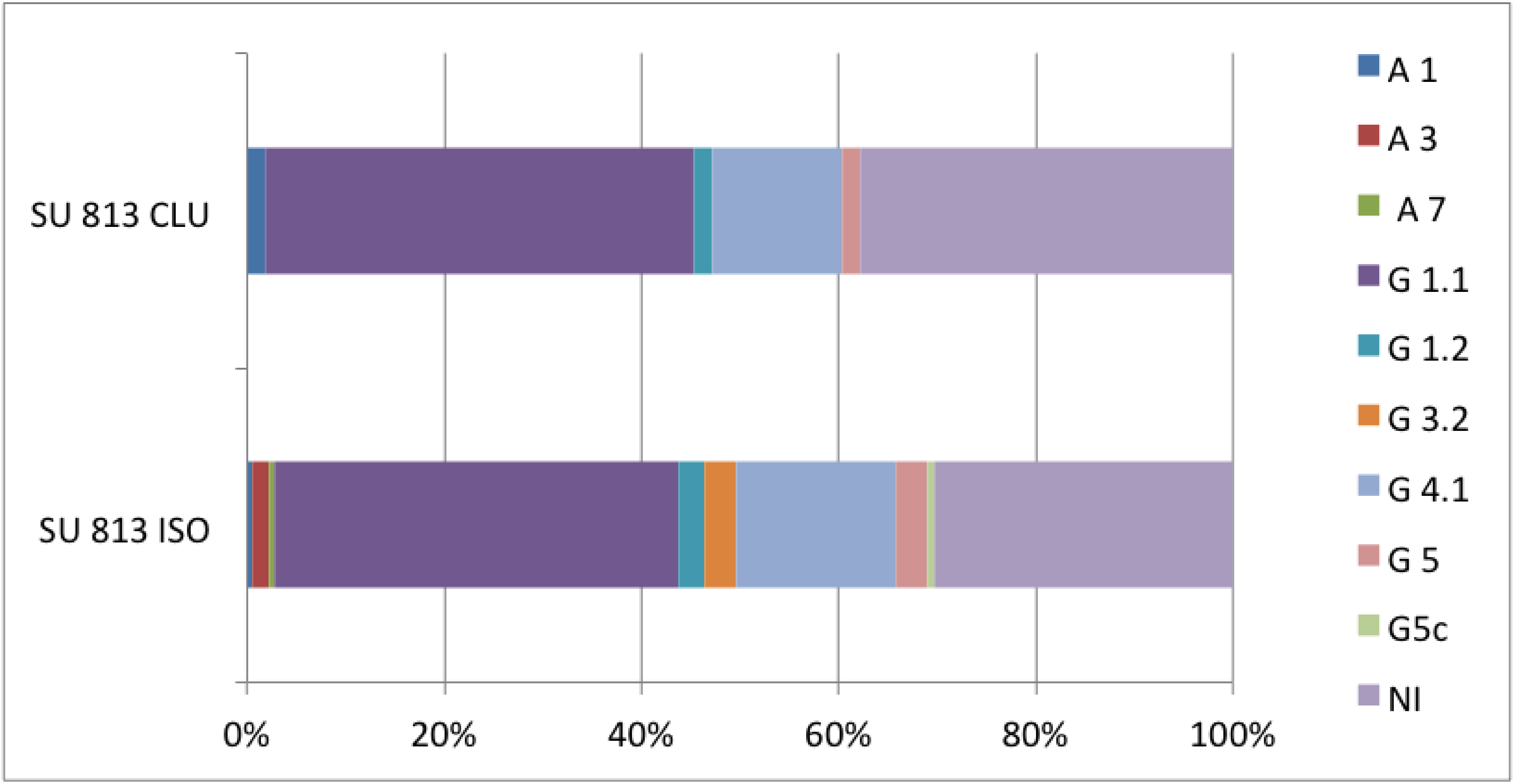
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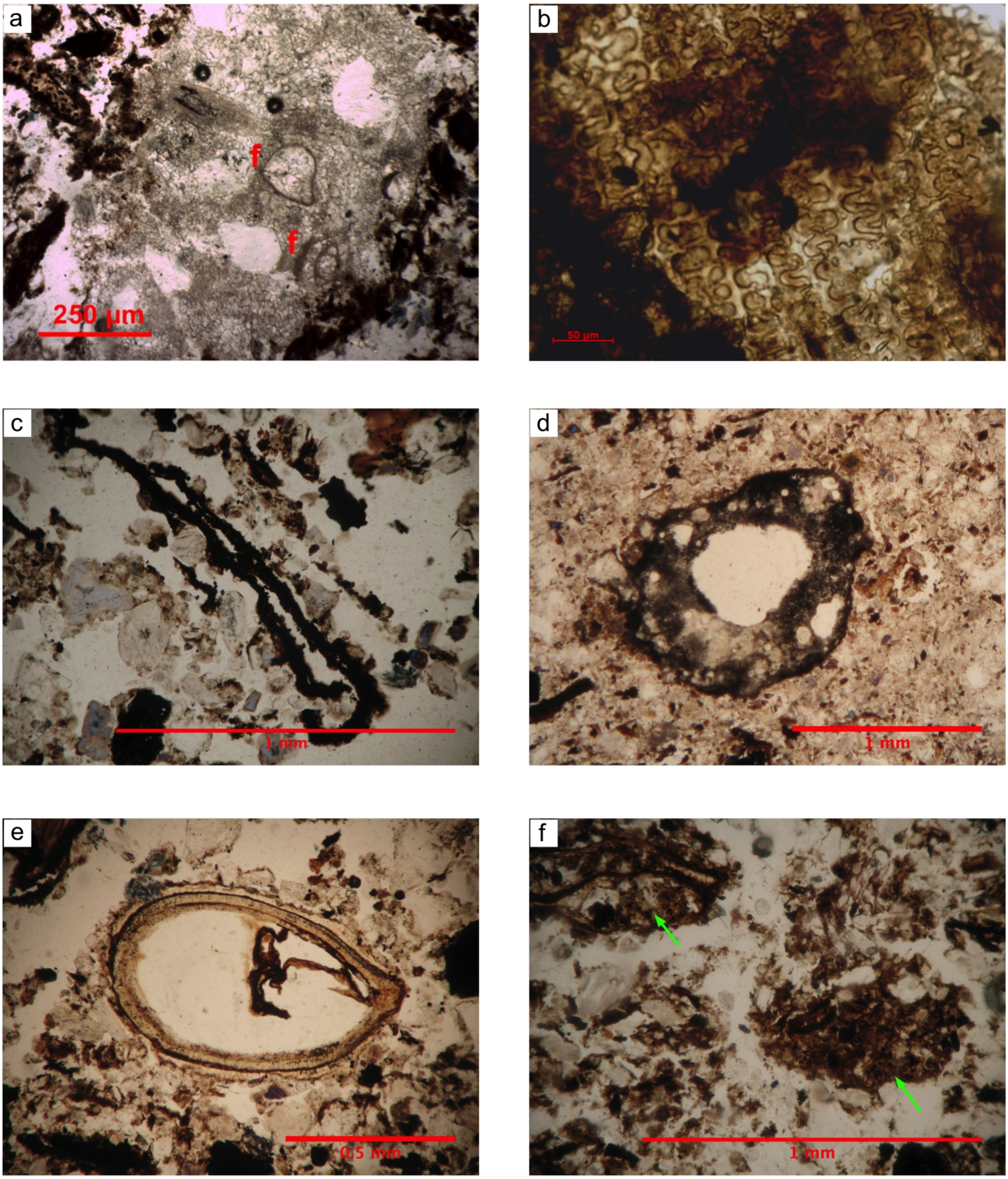
G 5
G5c
NI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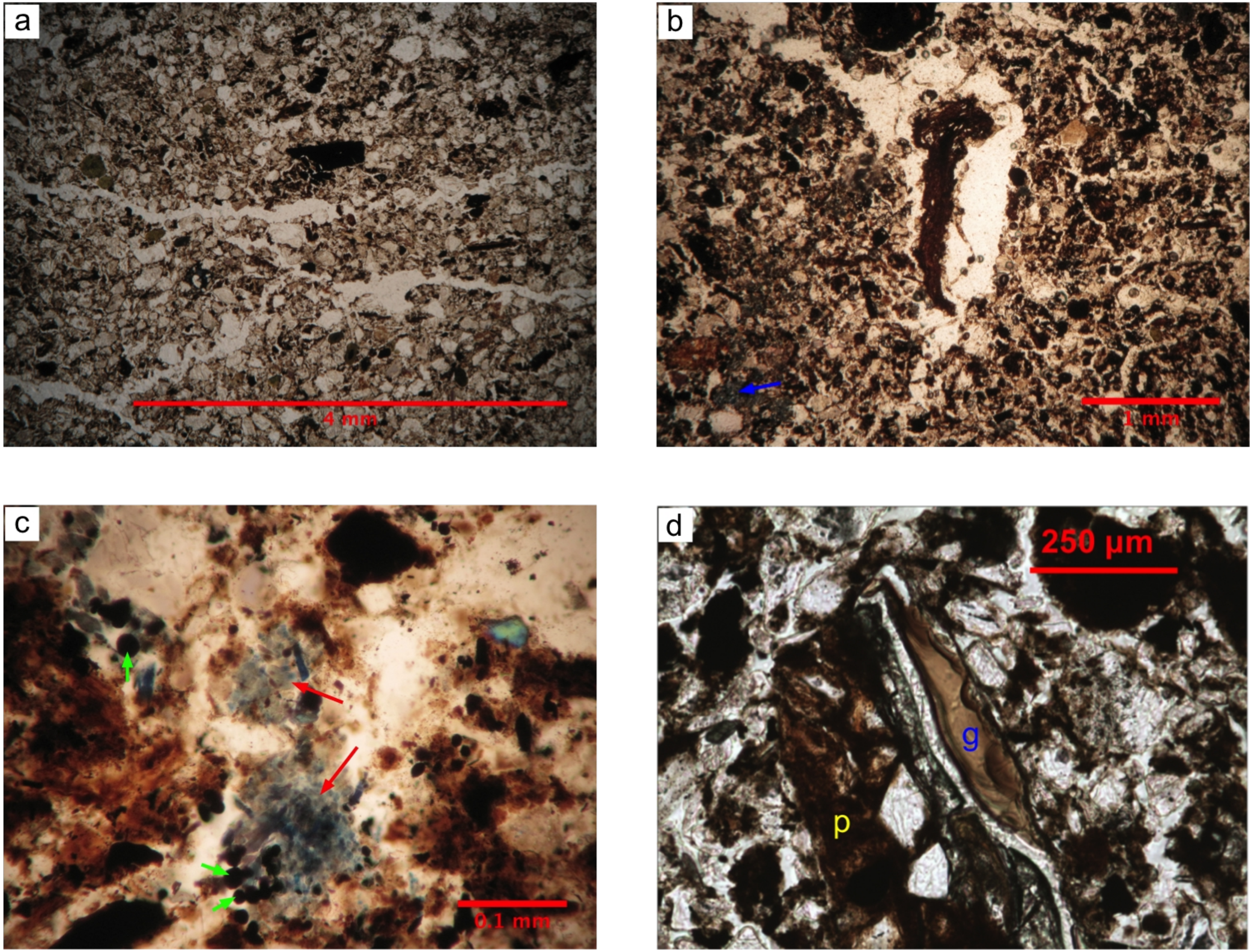
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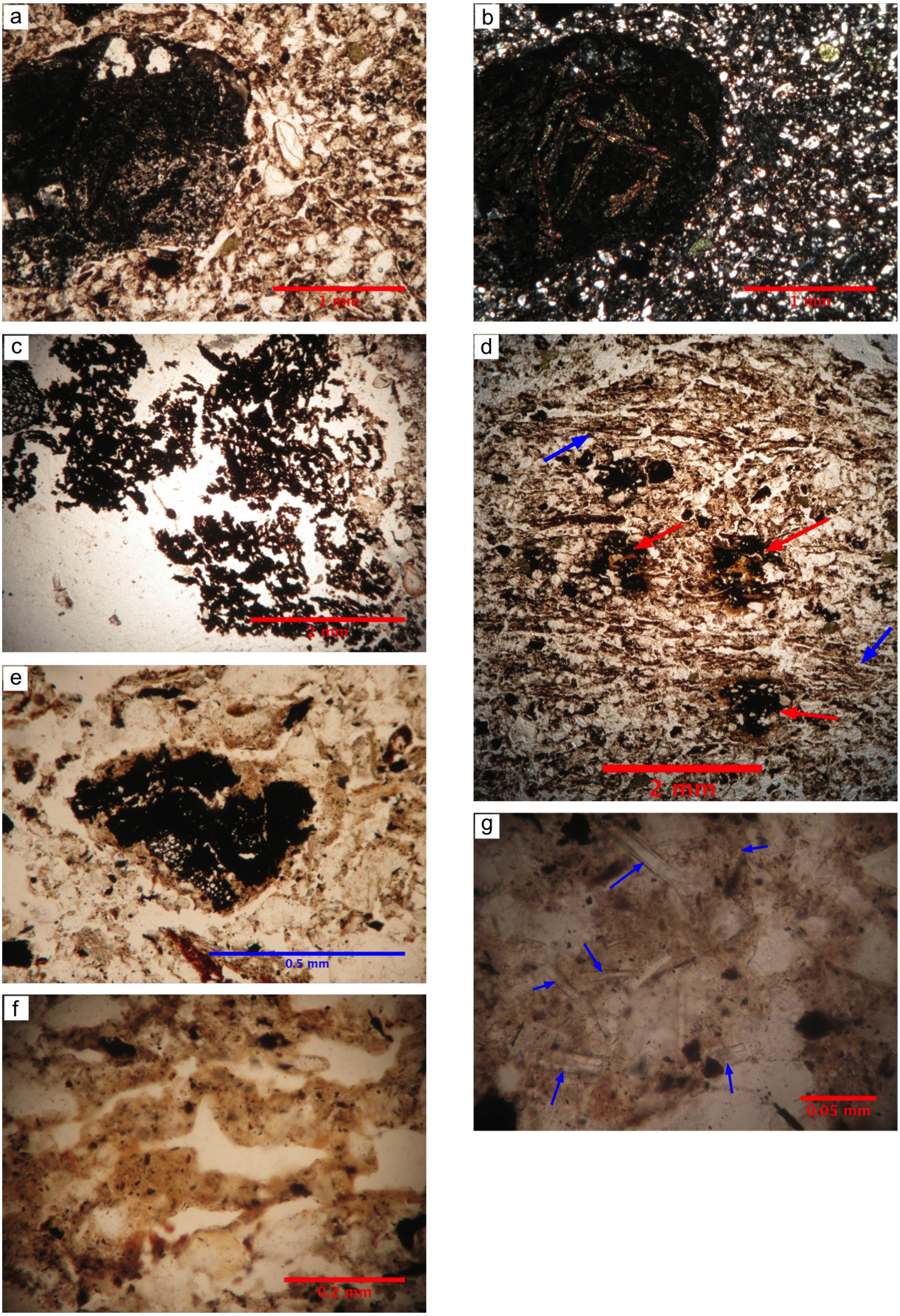
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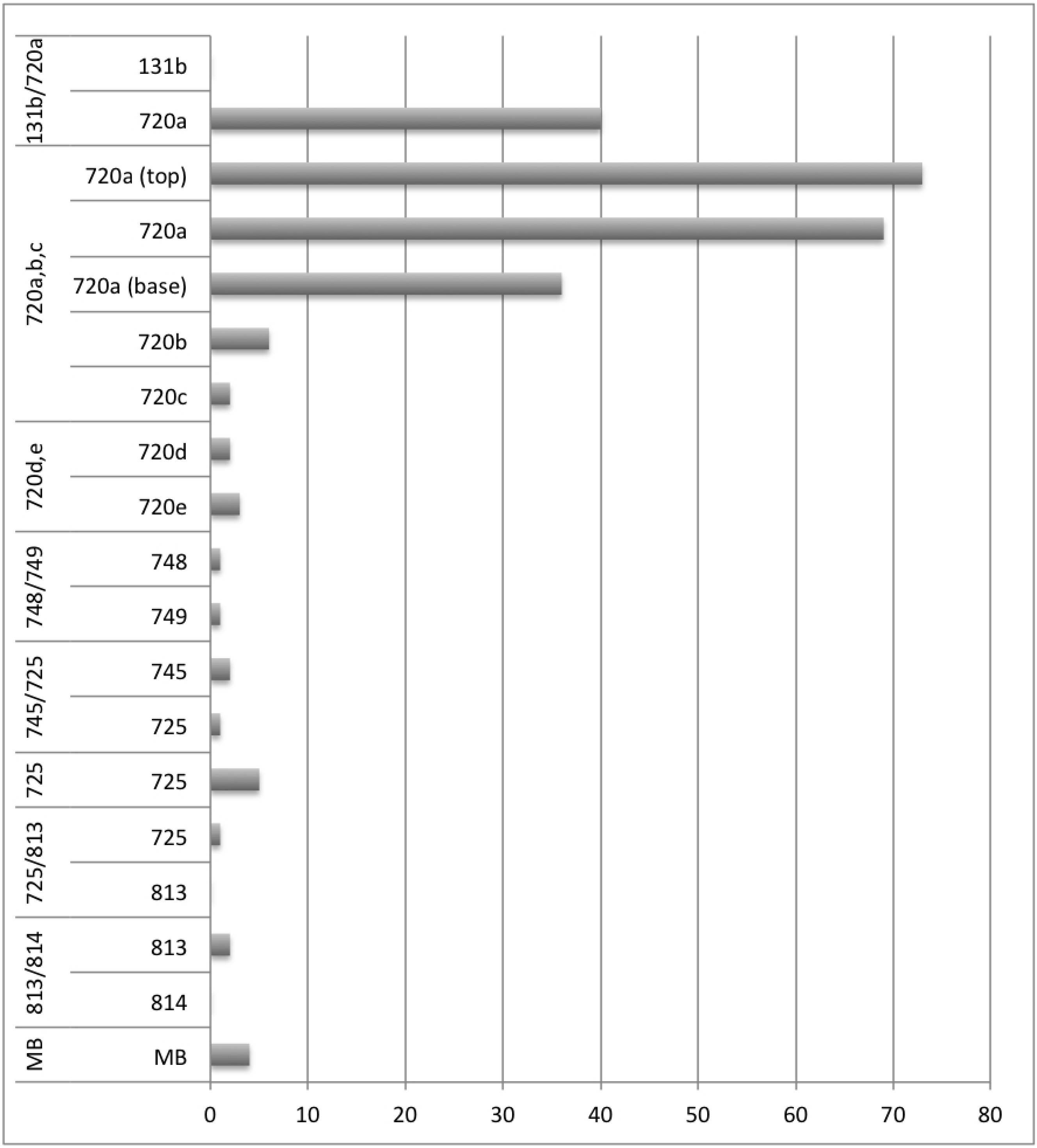
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720a
720a,b,c
720a (top)
720a
720a (base)
720b
720c
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720d
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748/749
748
749
745/725
745
725
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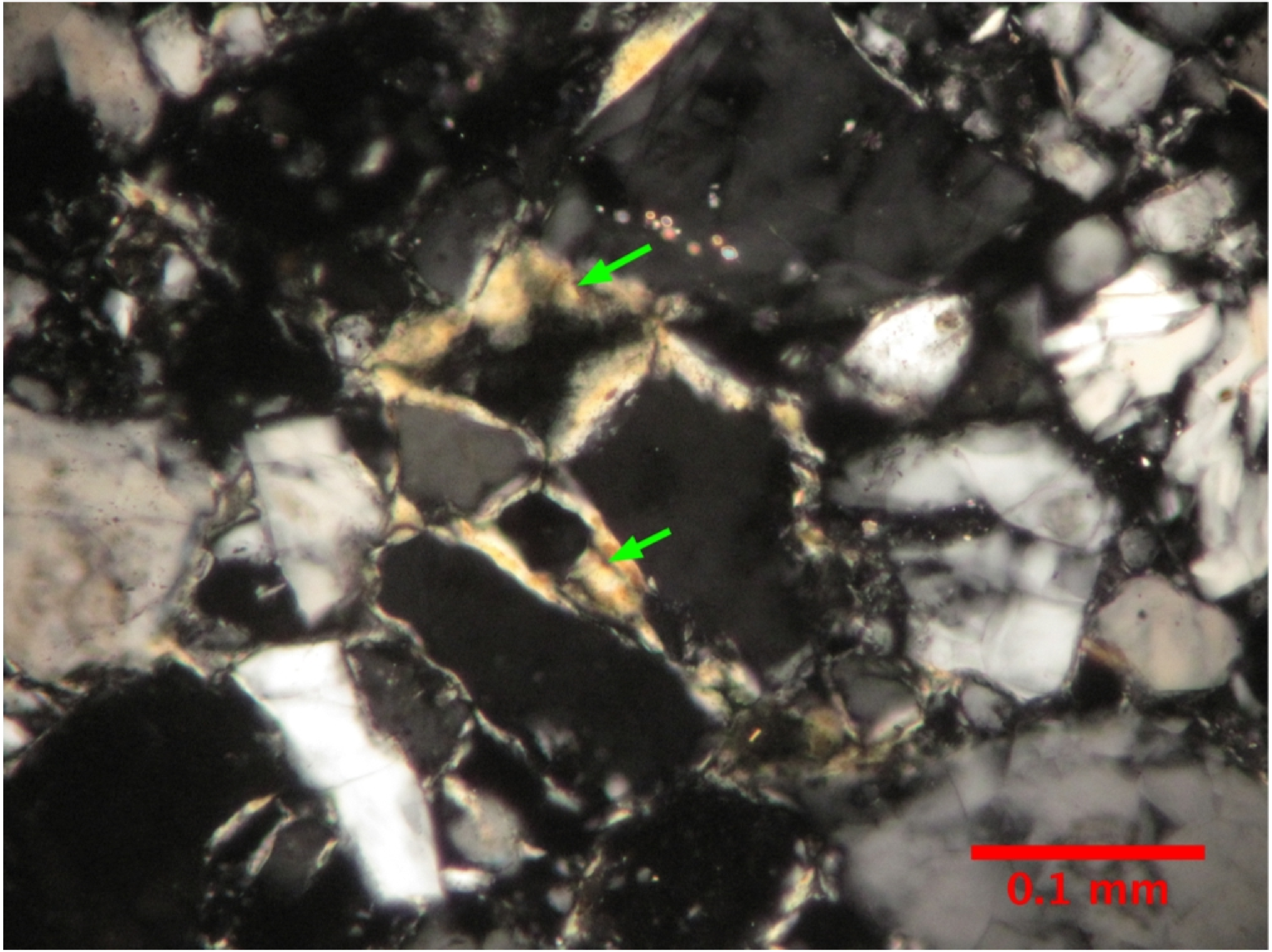
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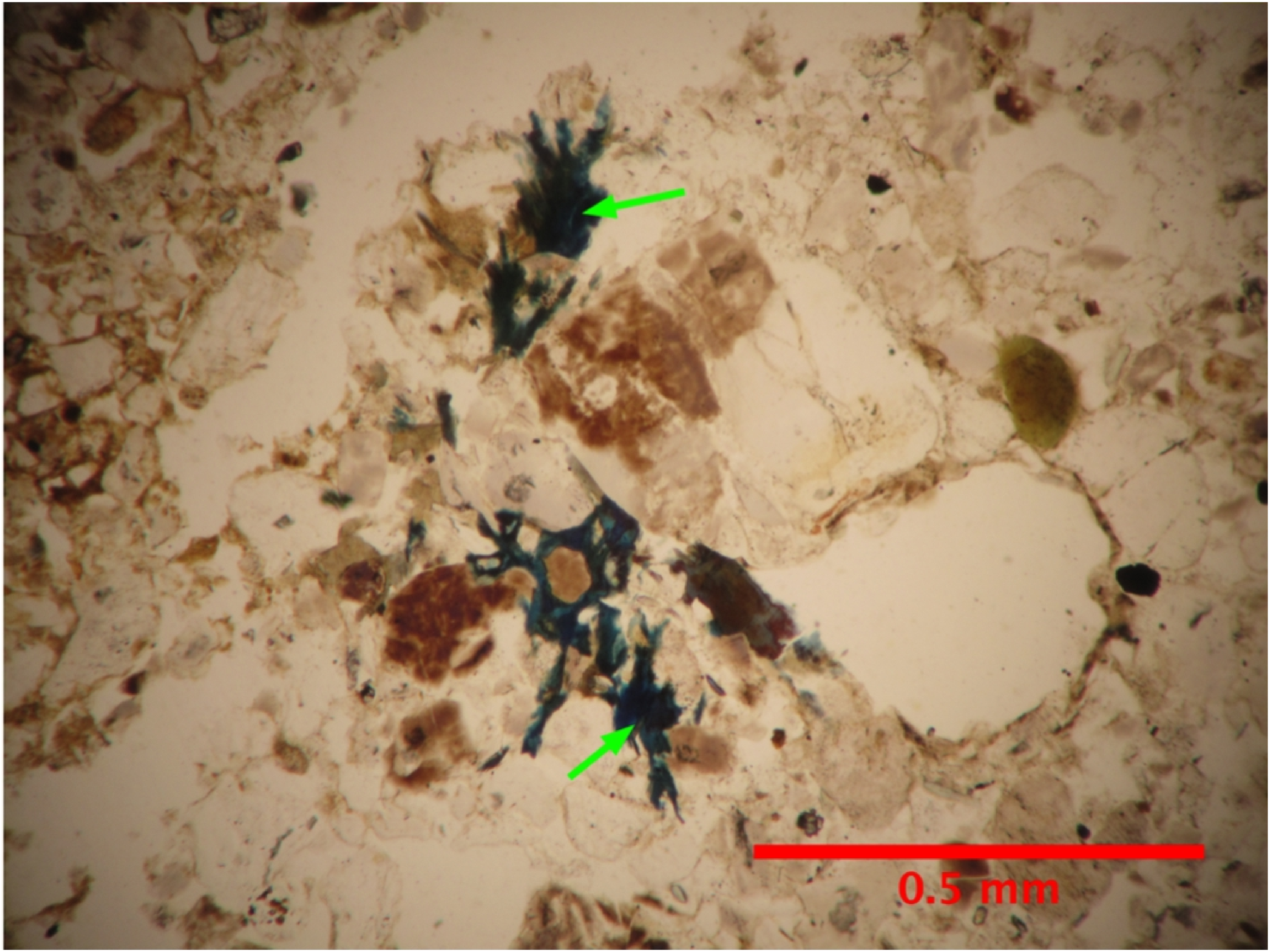
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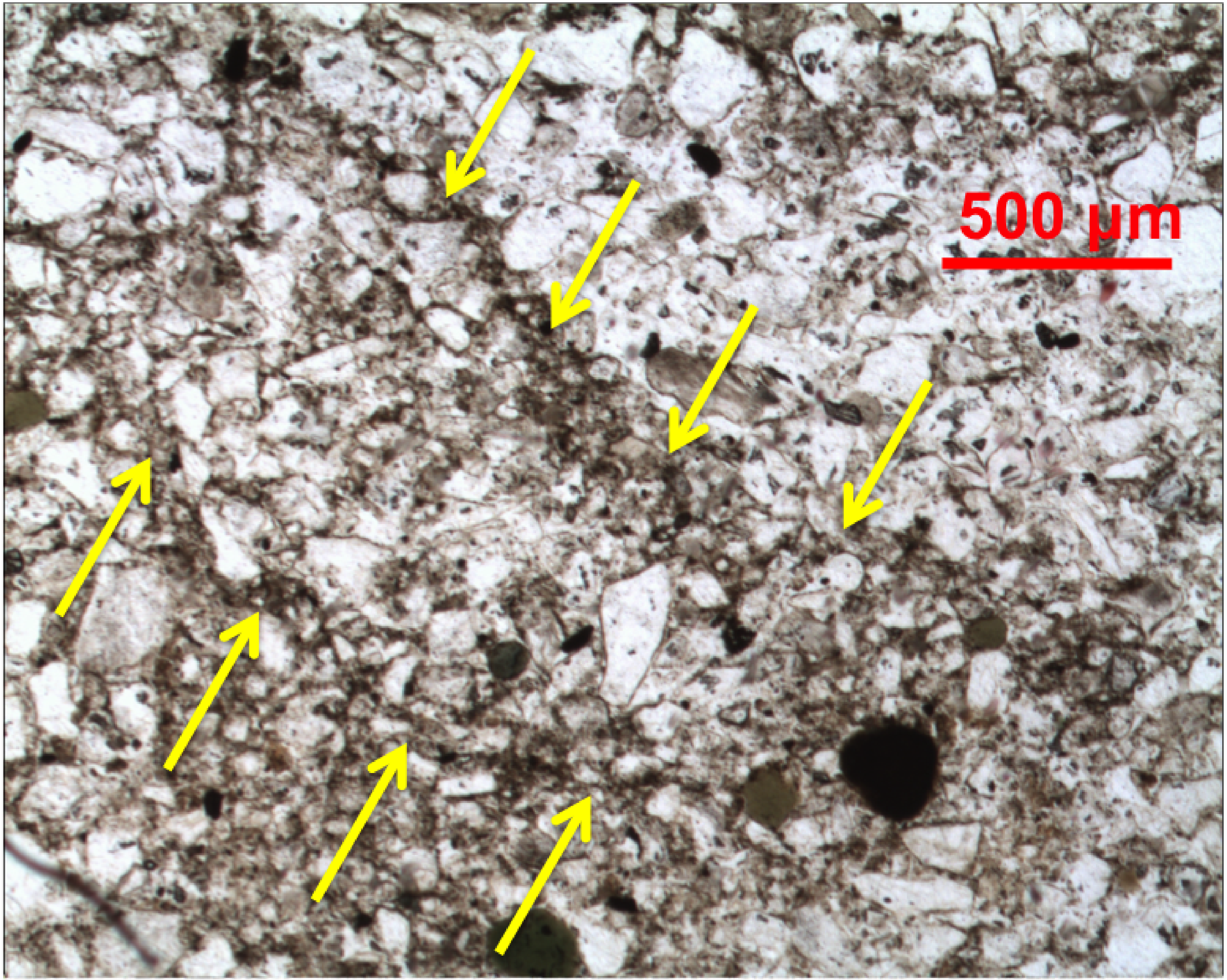
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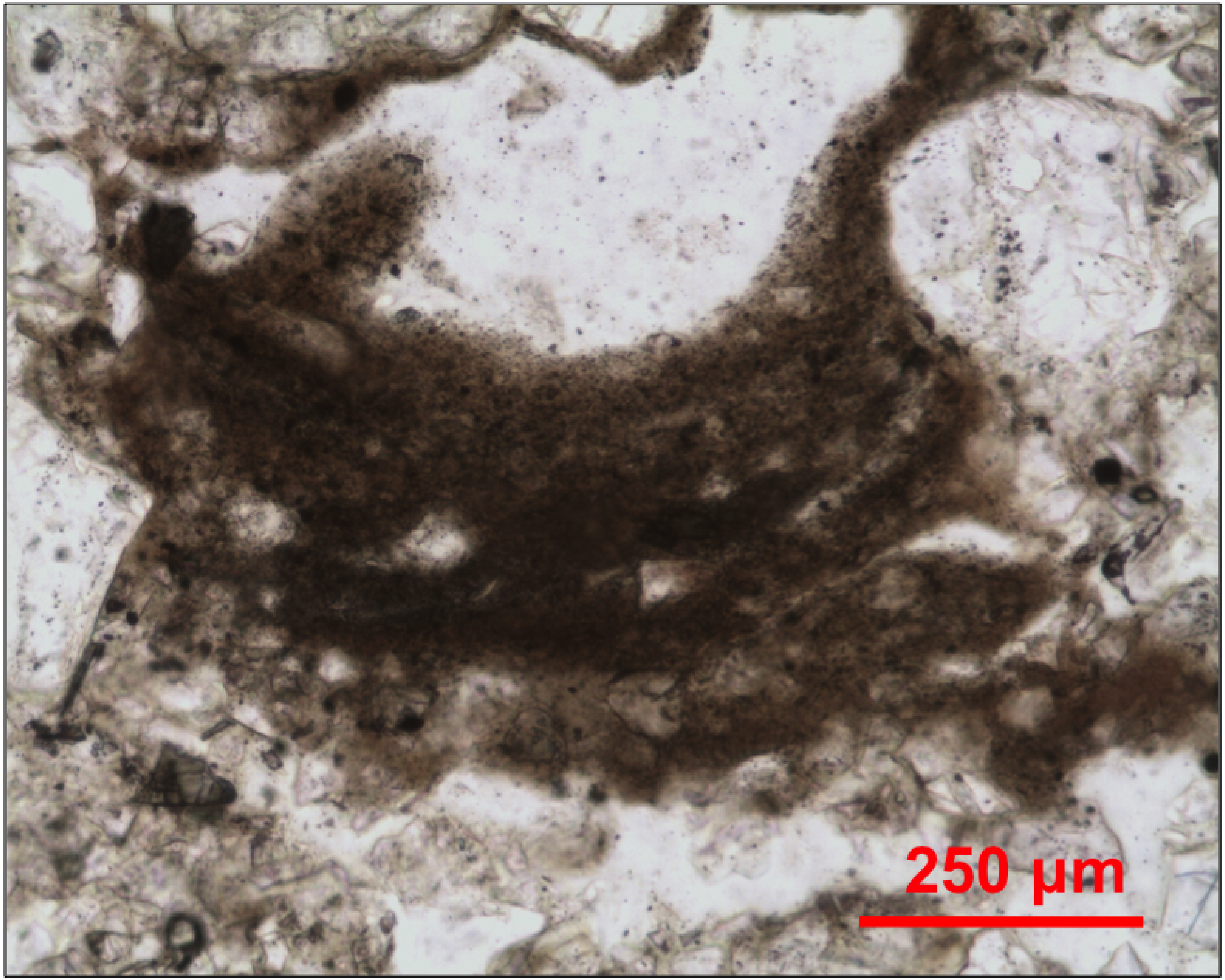
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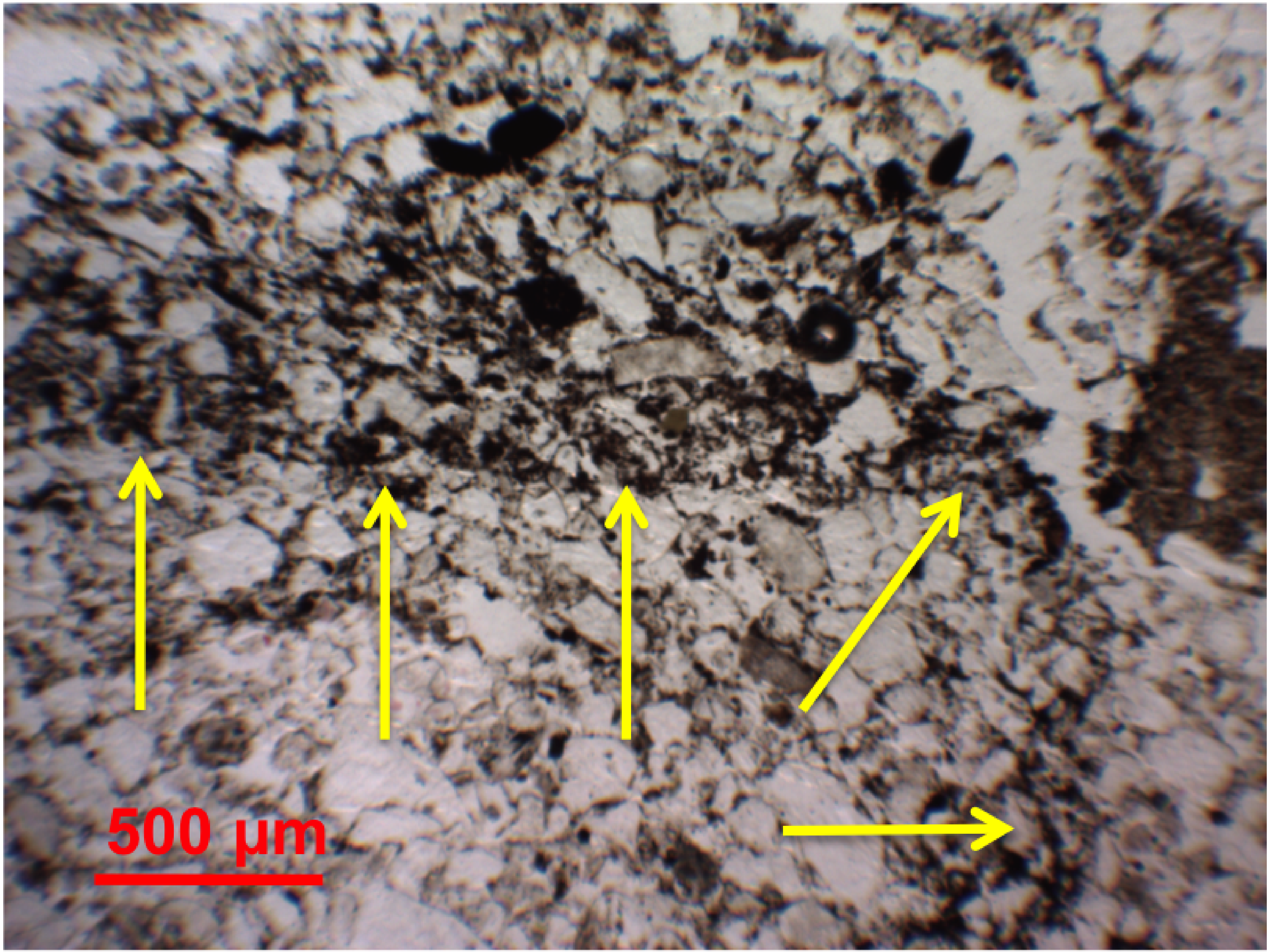
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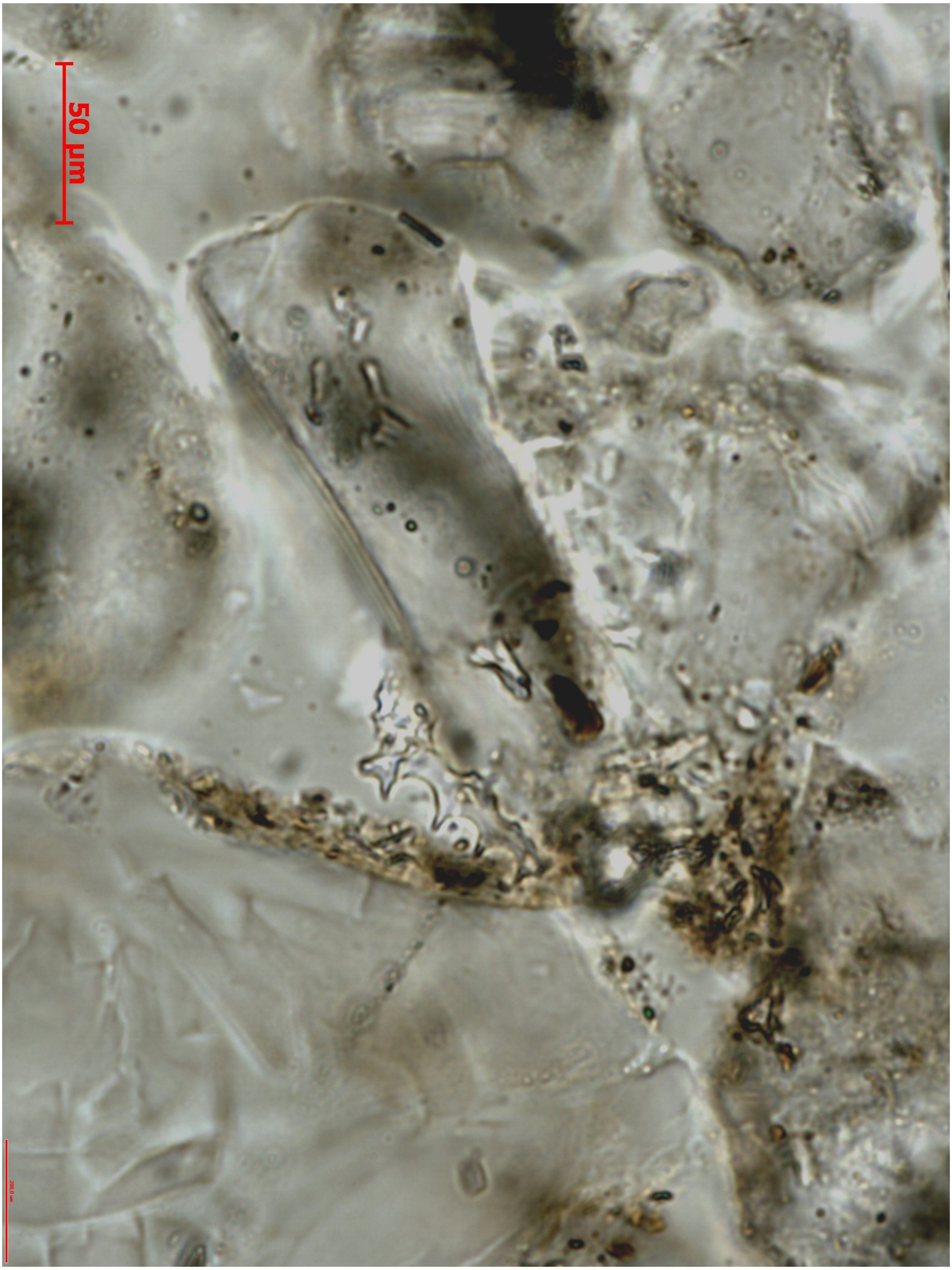
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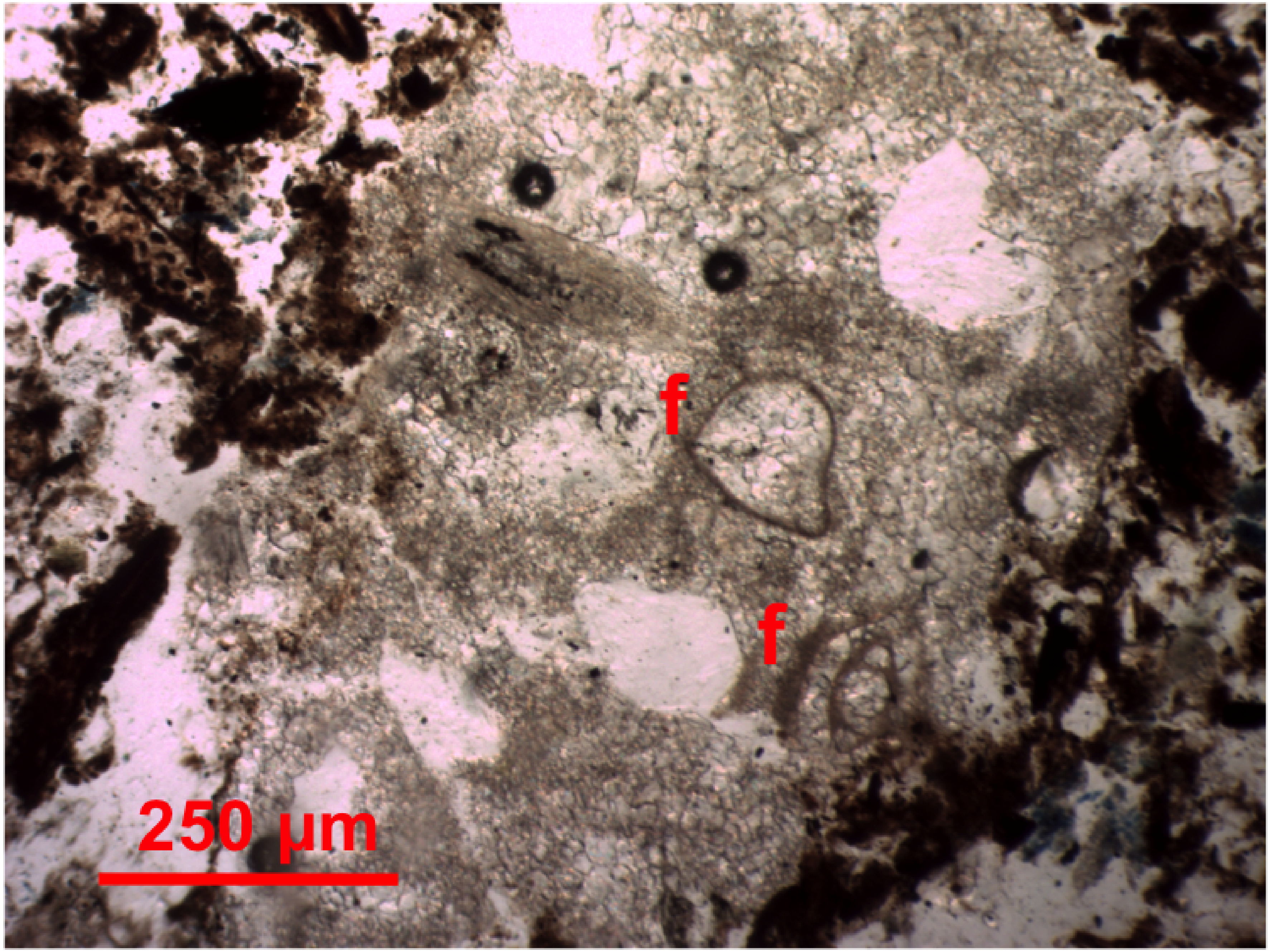
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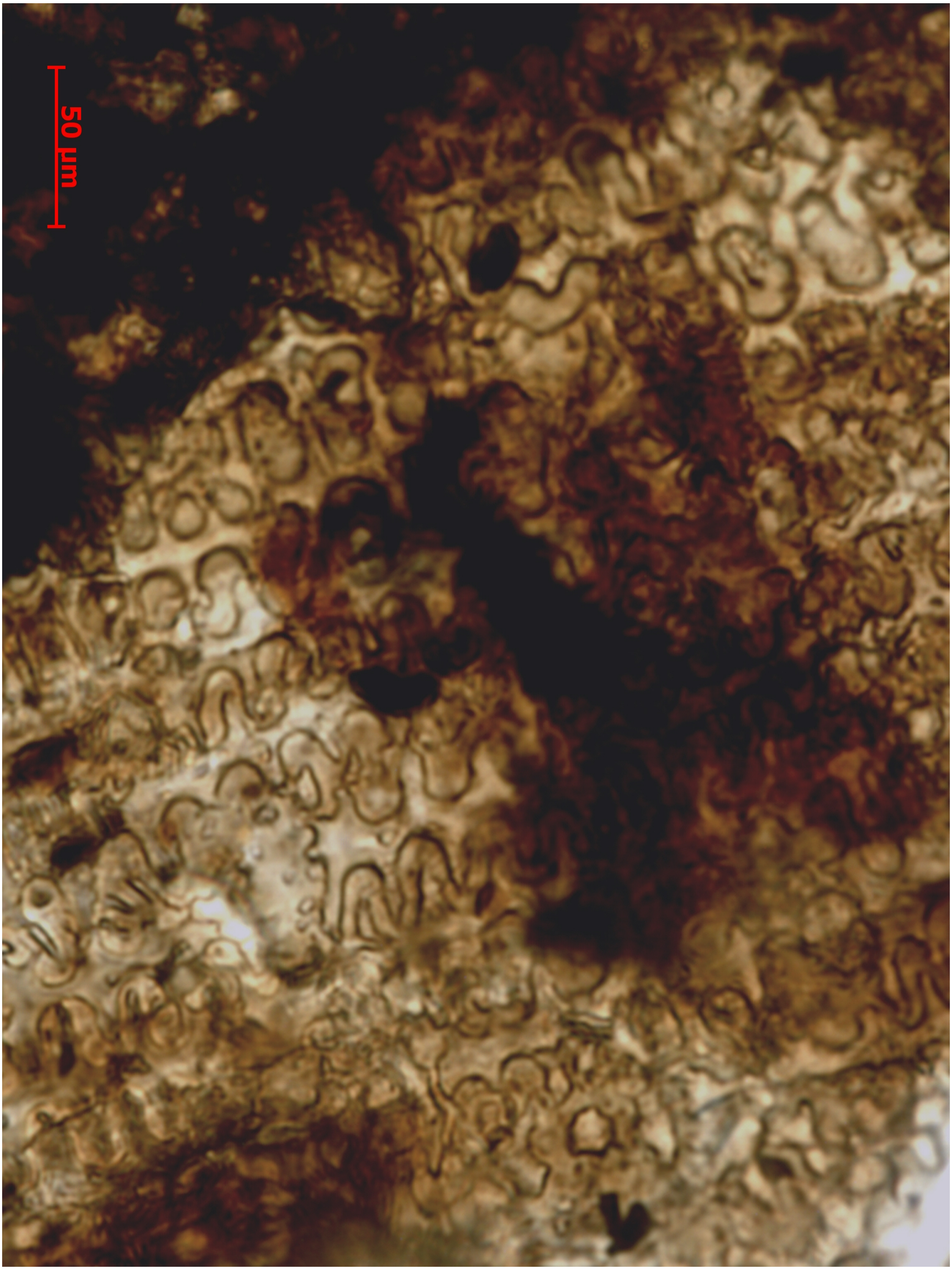
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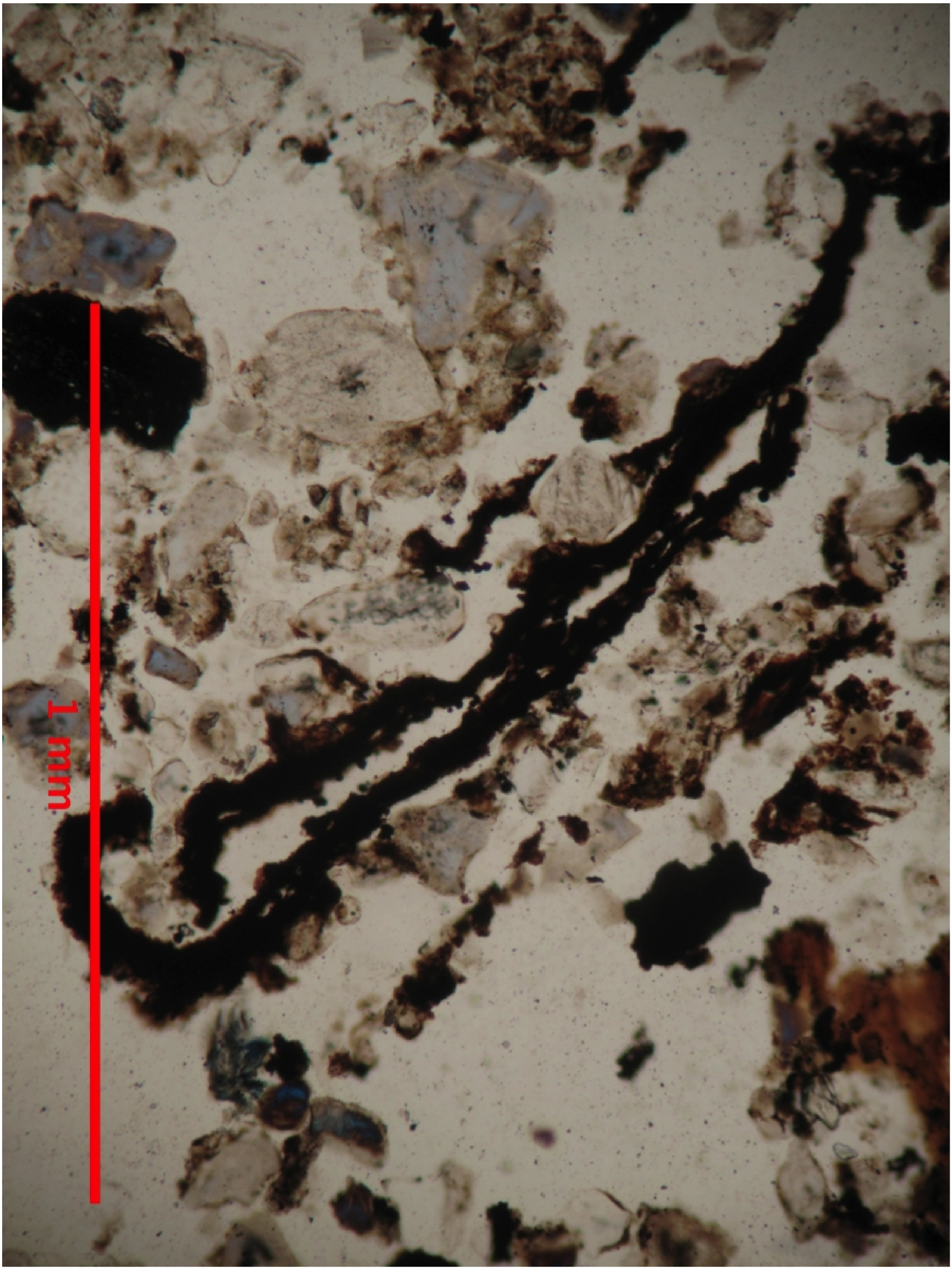
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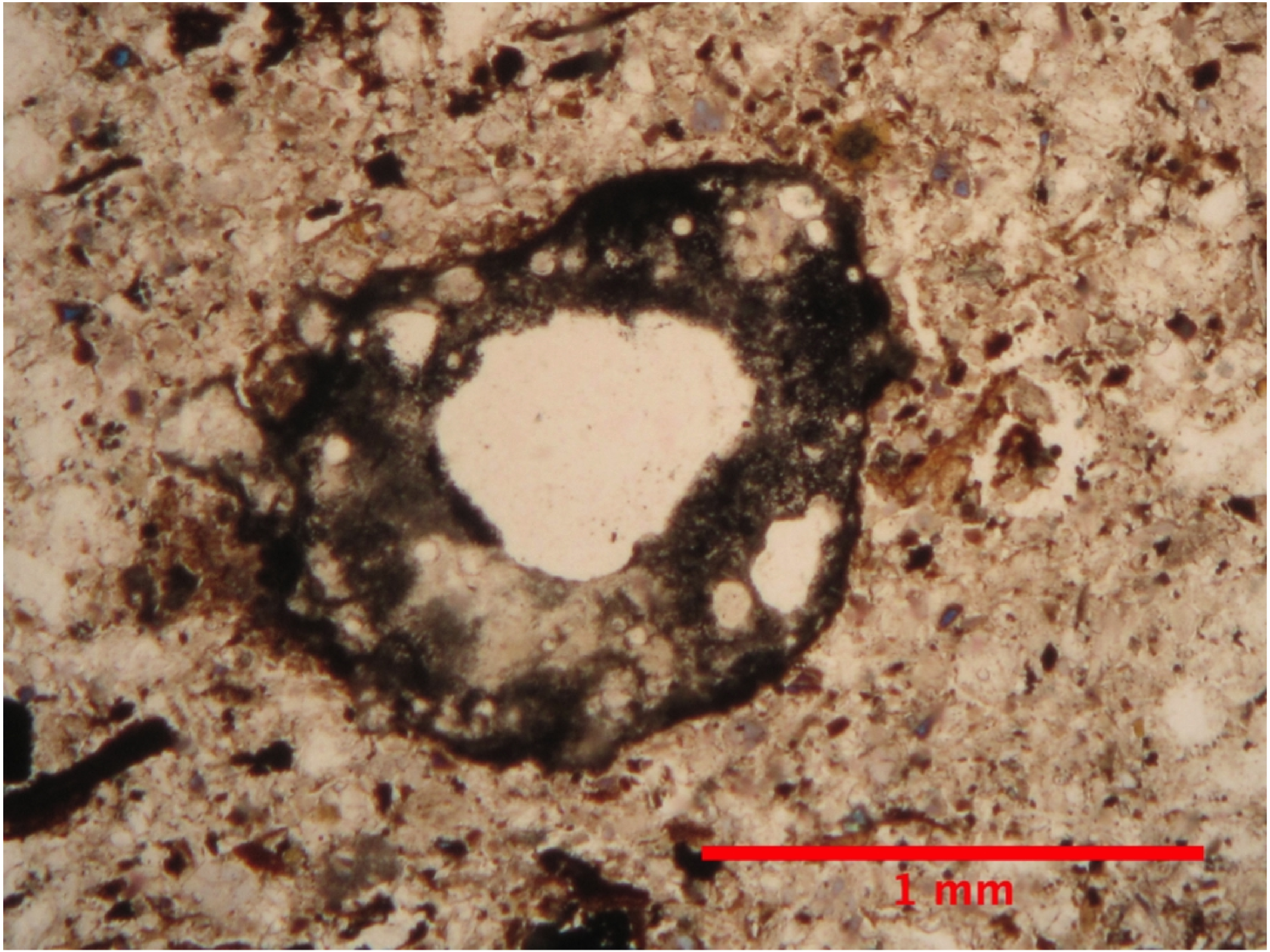
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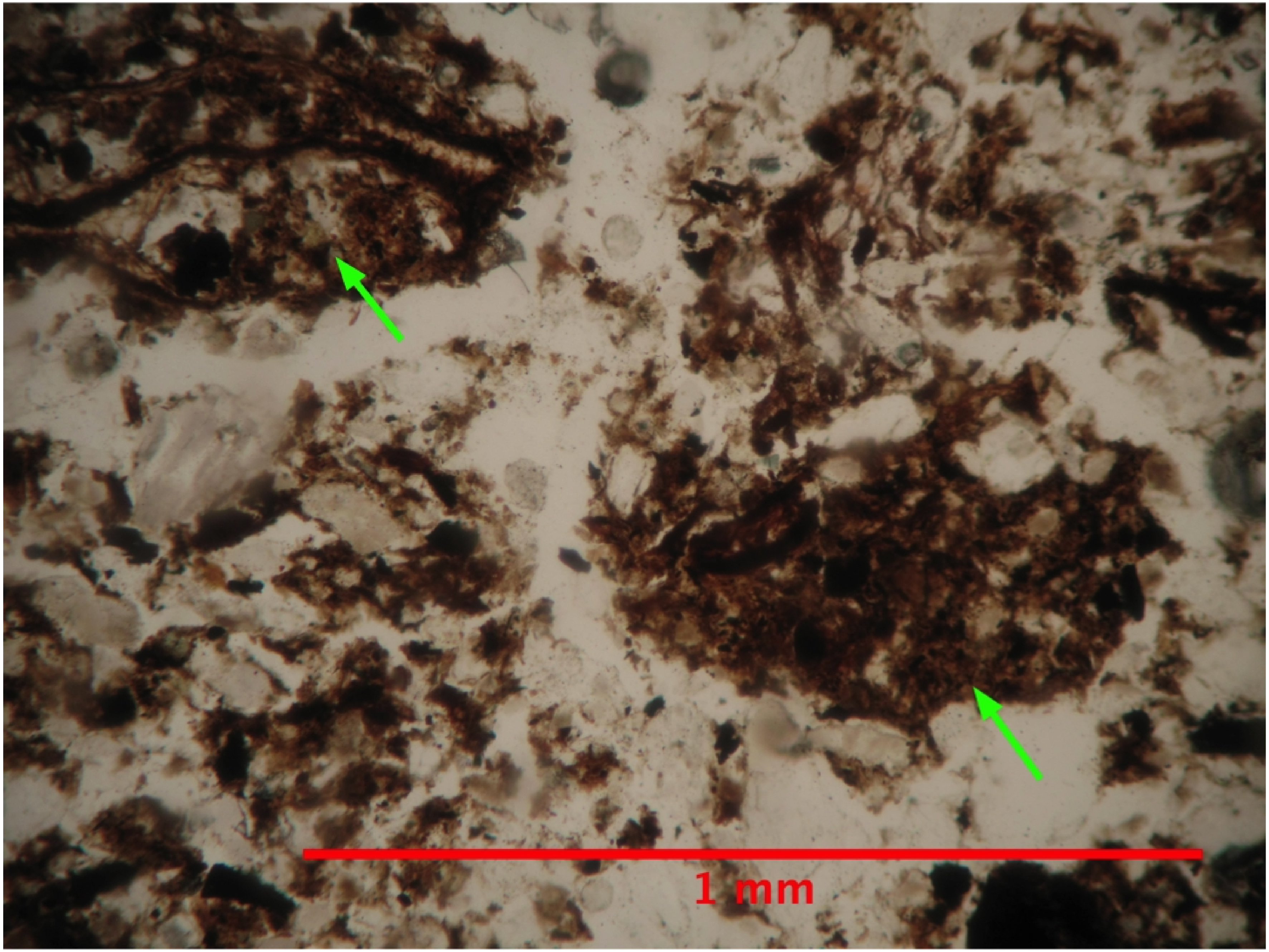
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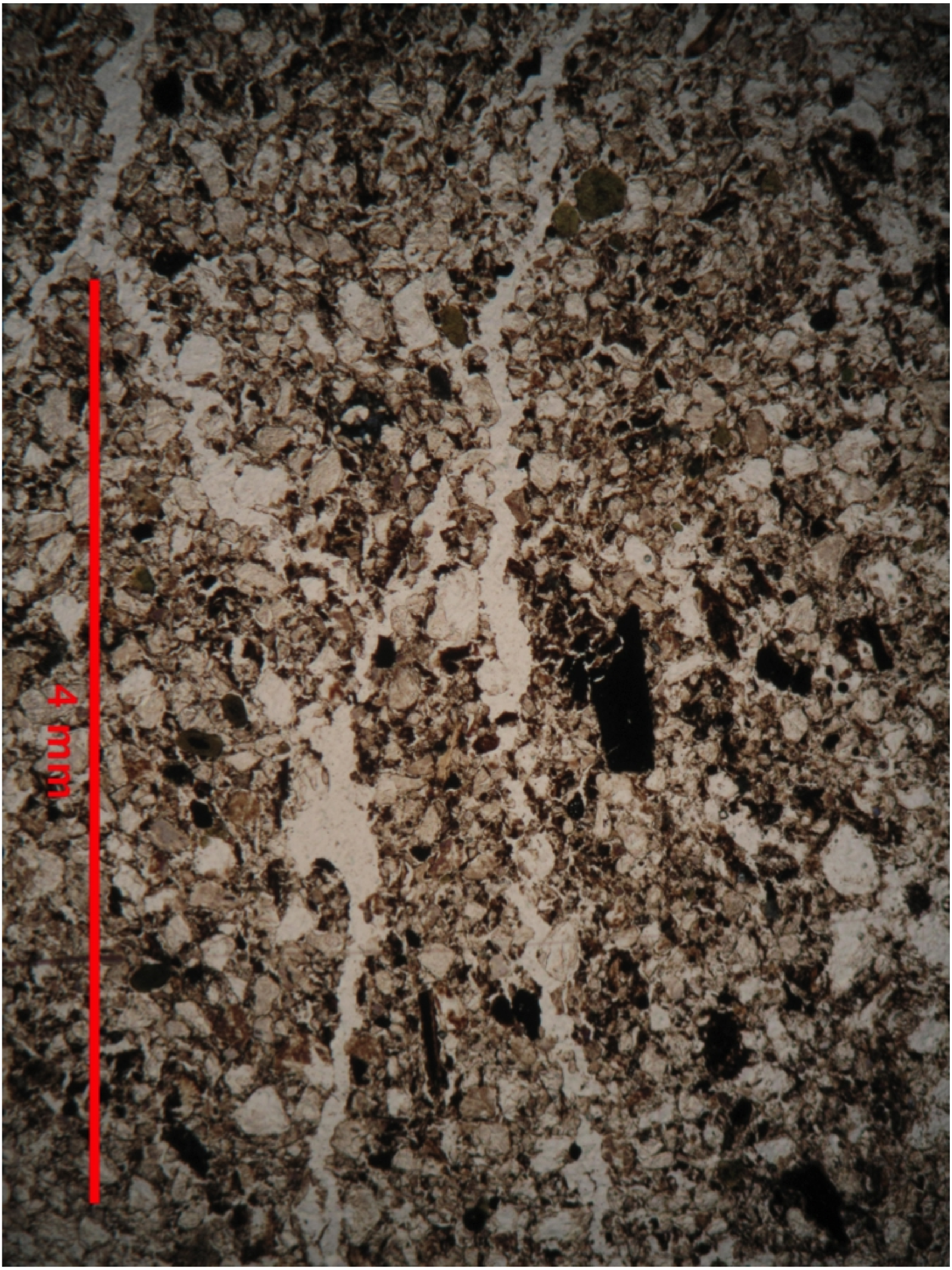
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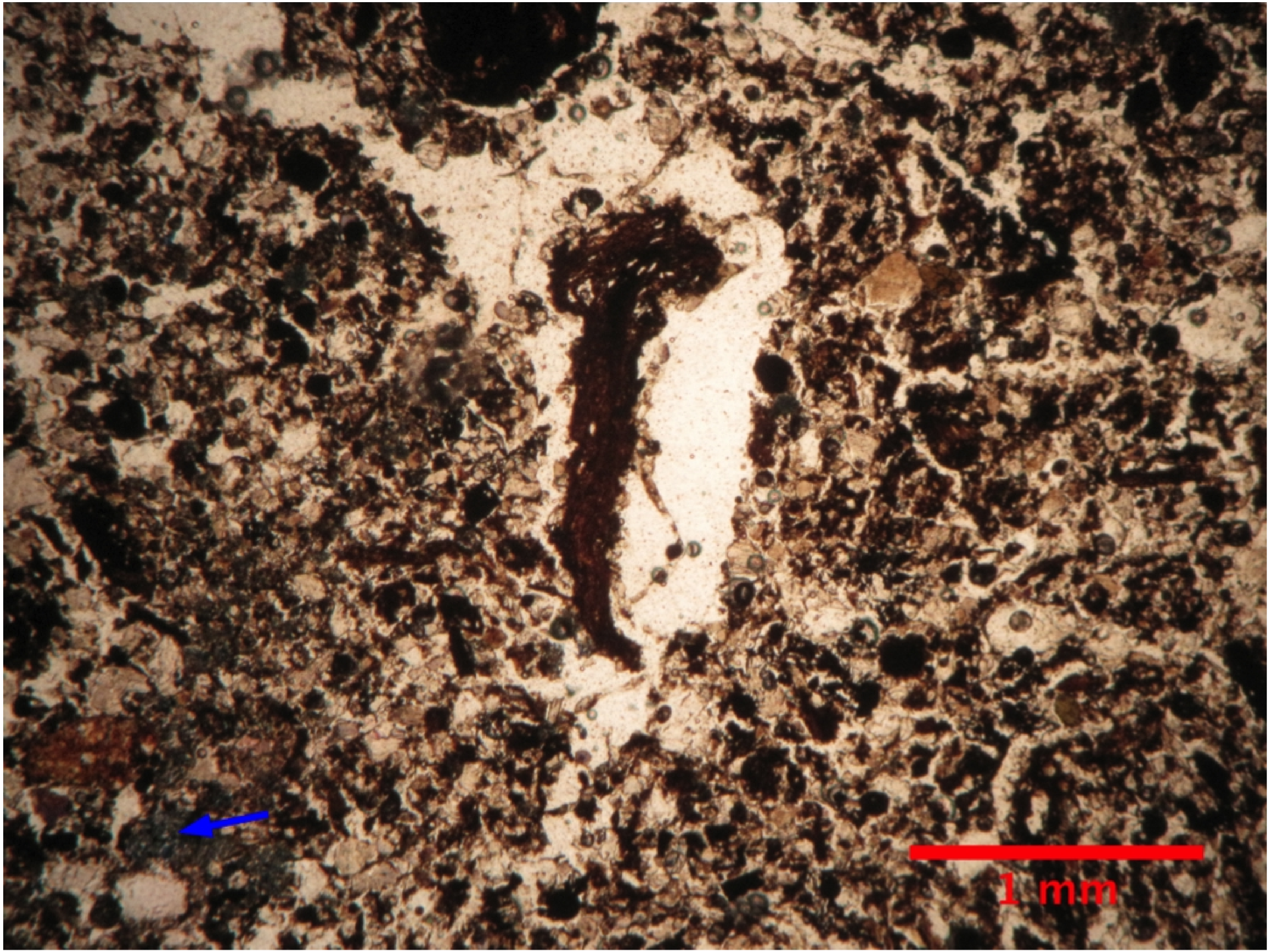
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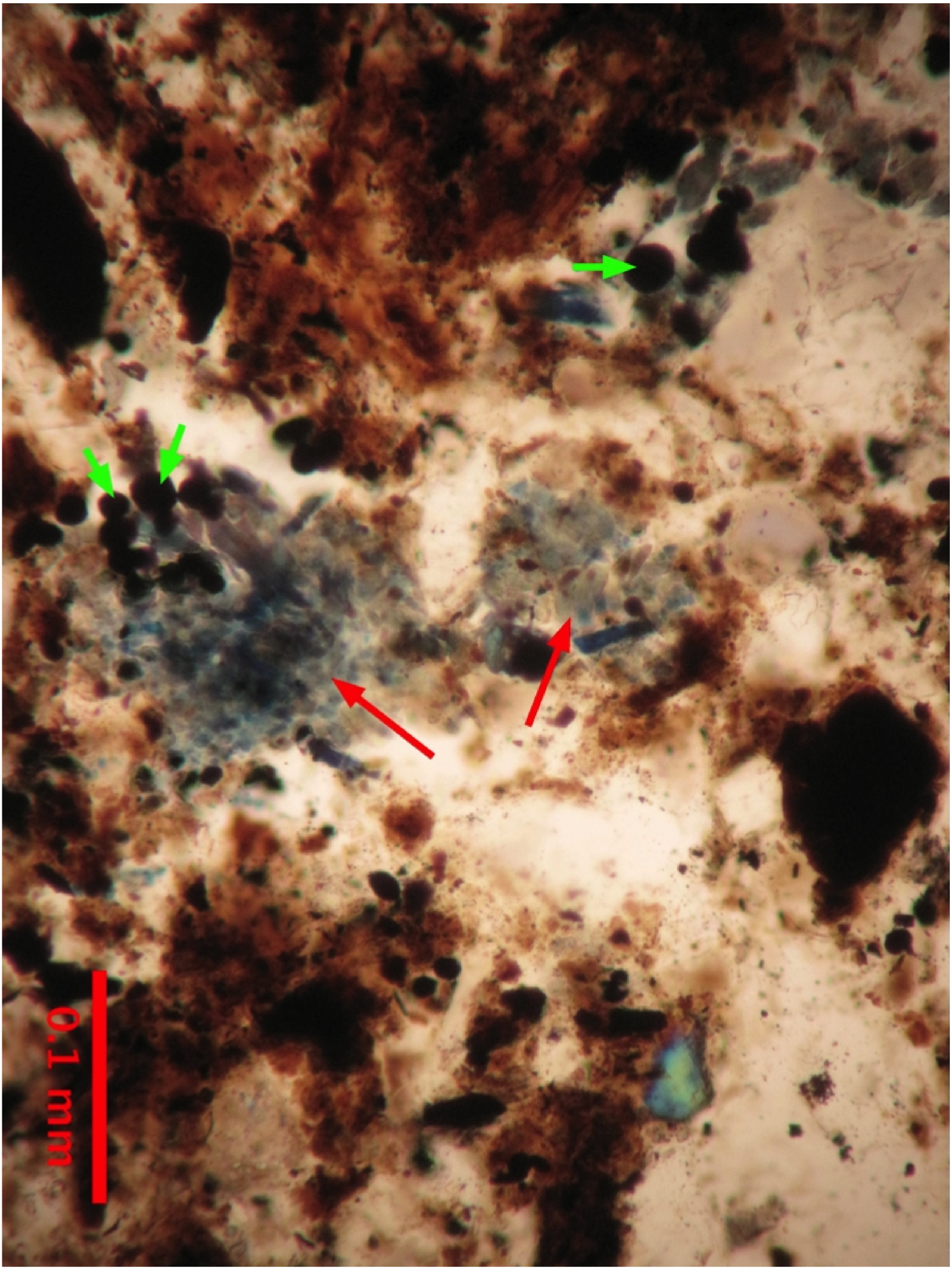
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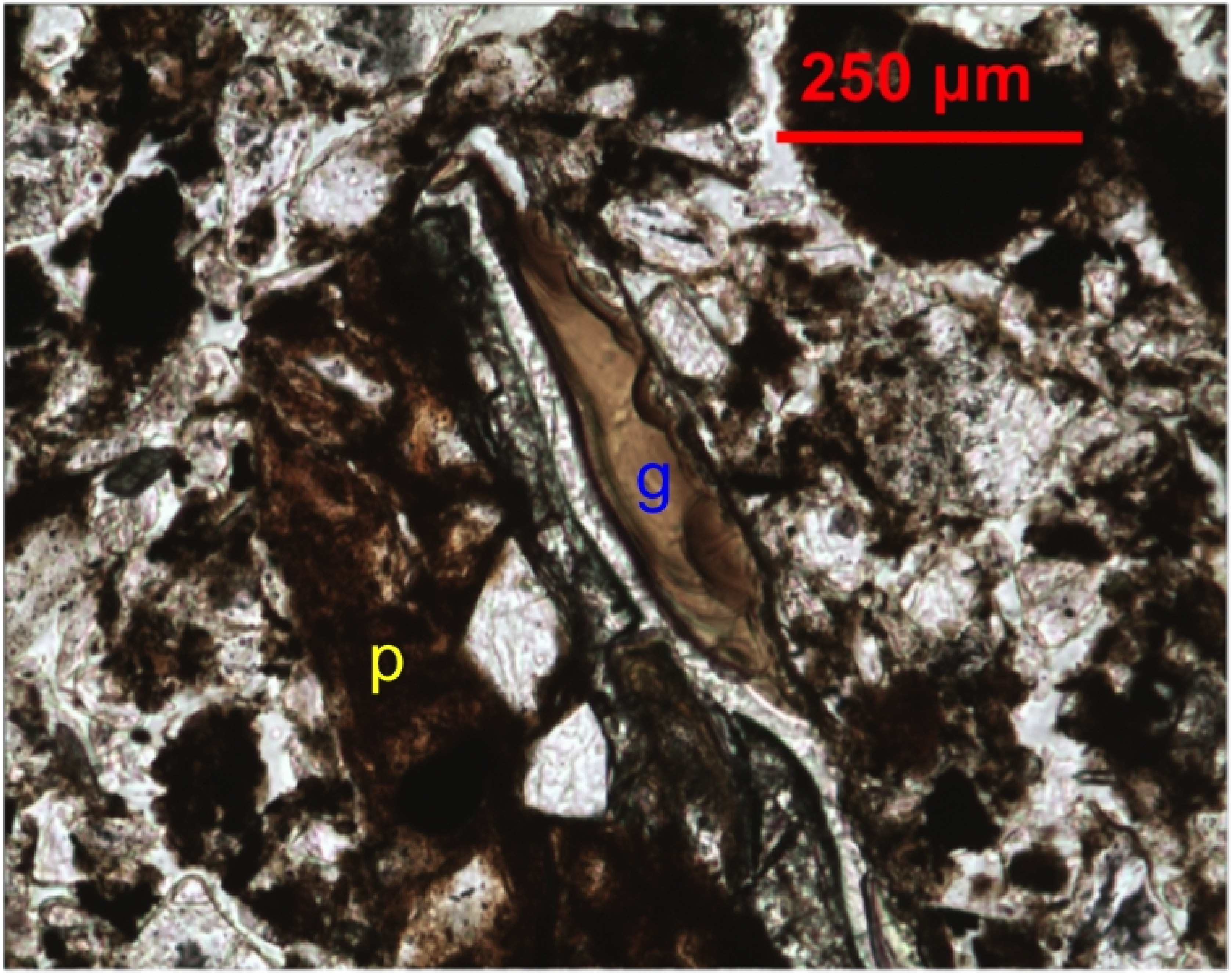
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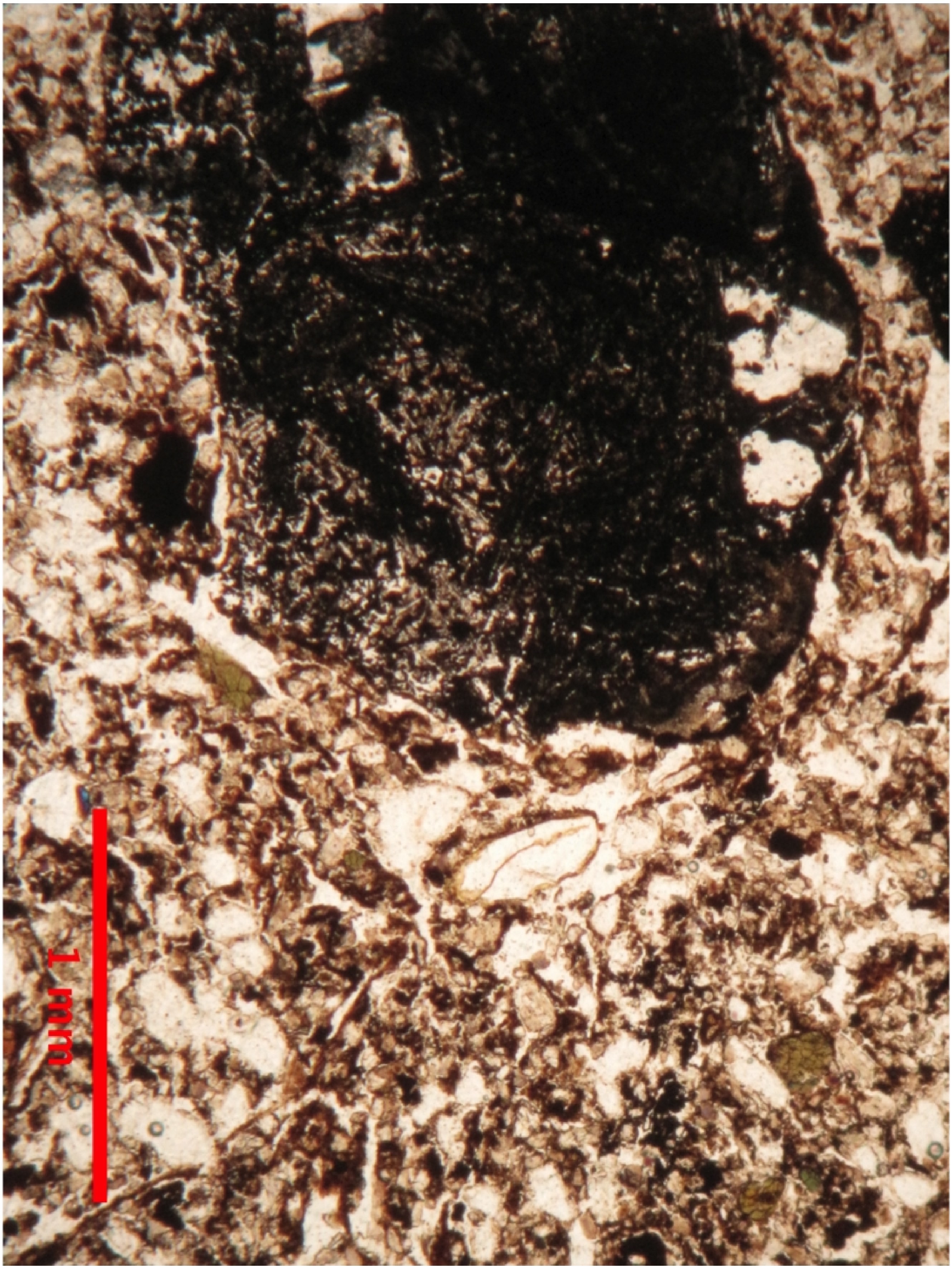
g
p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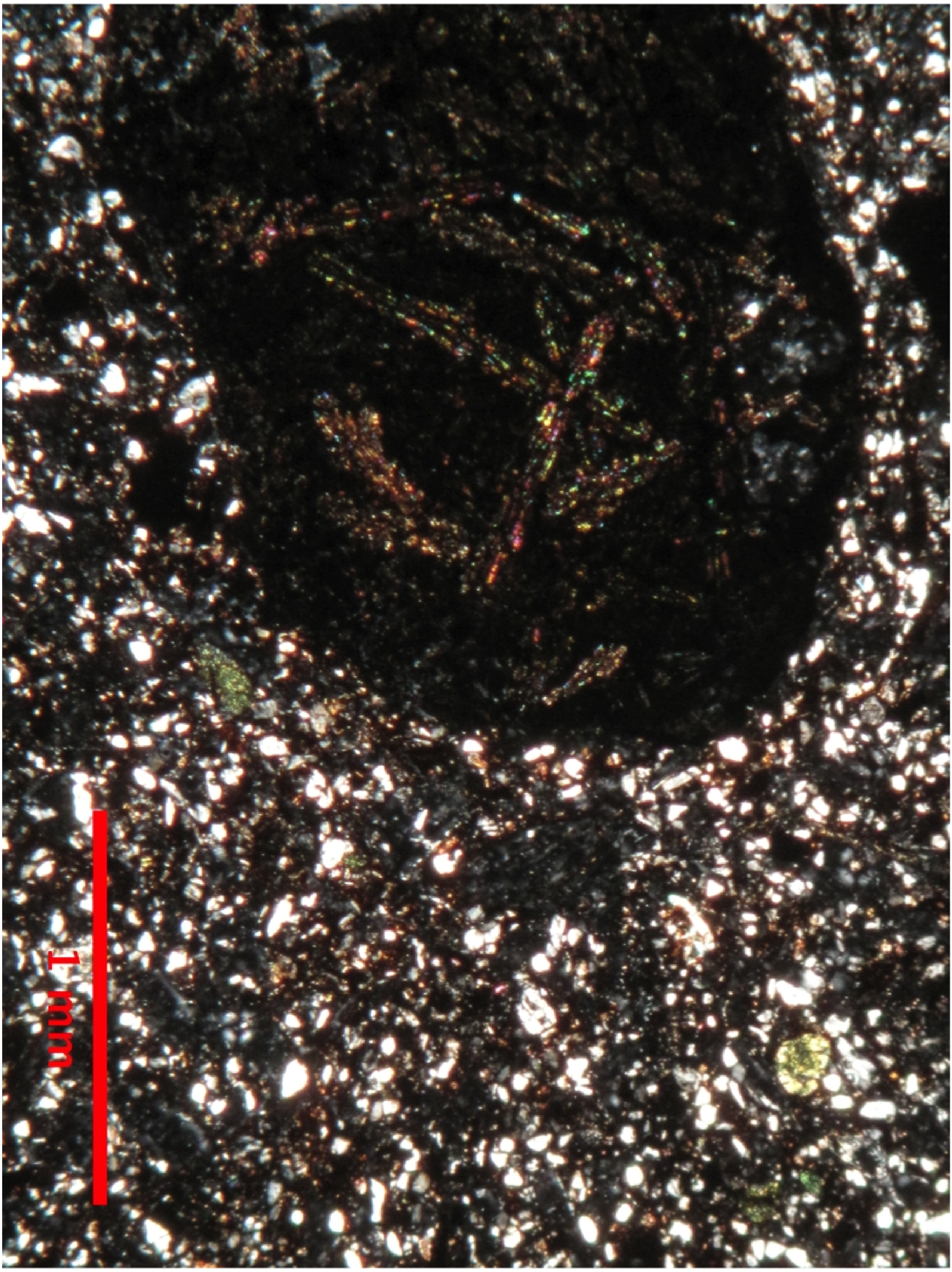
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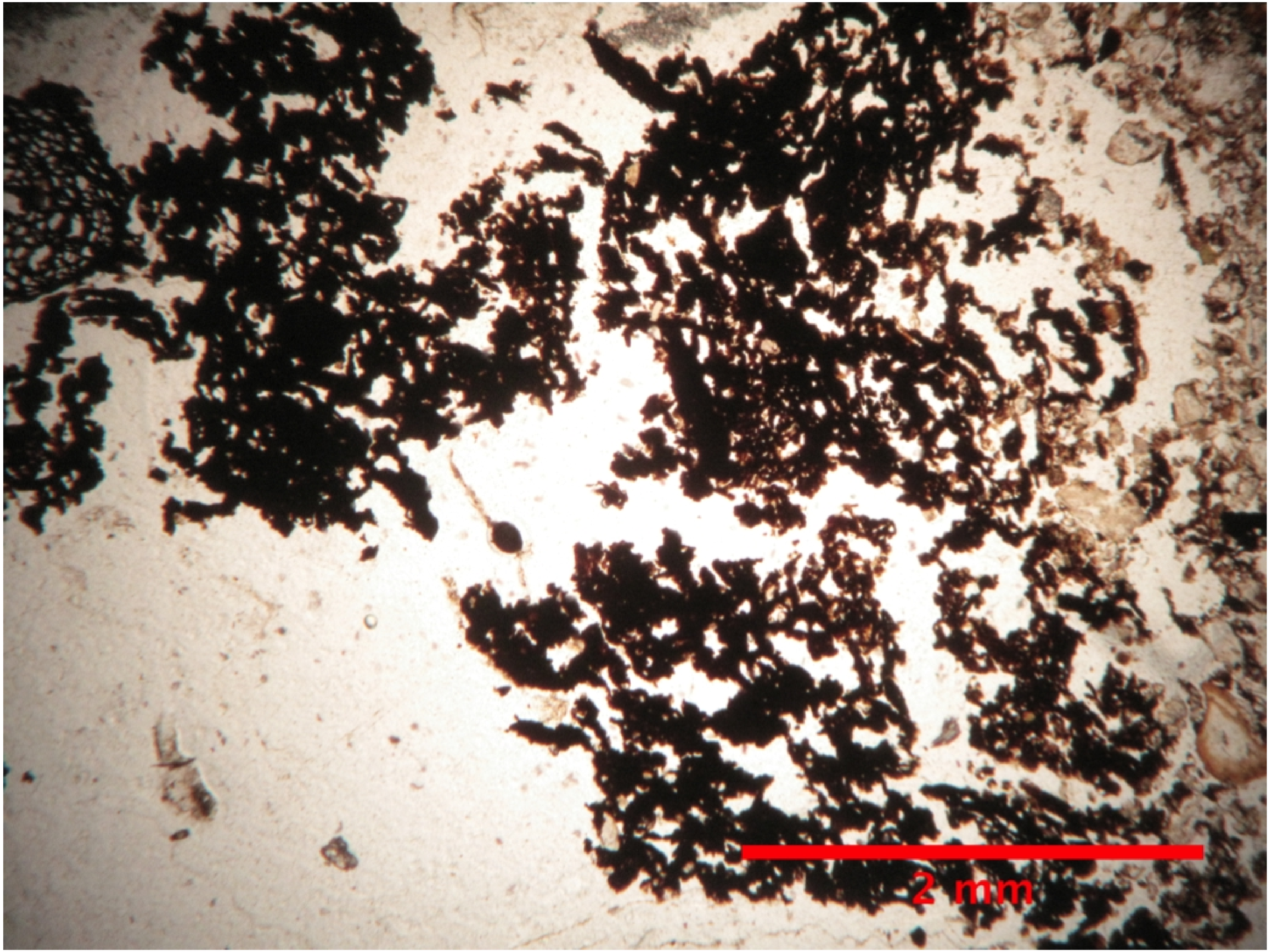
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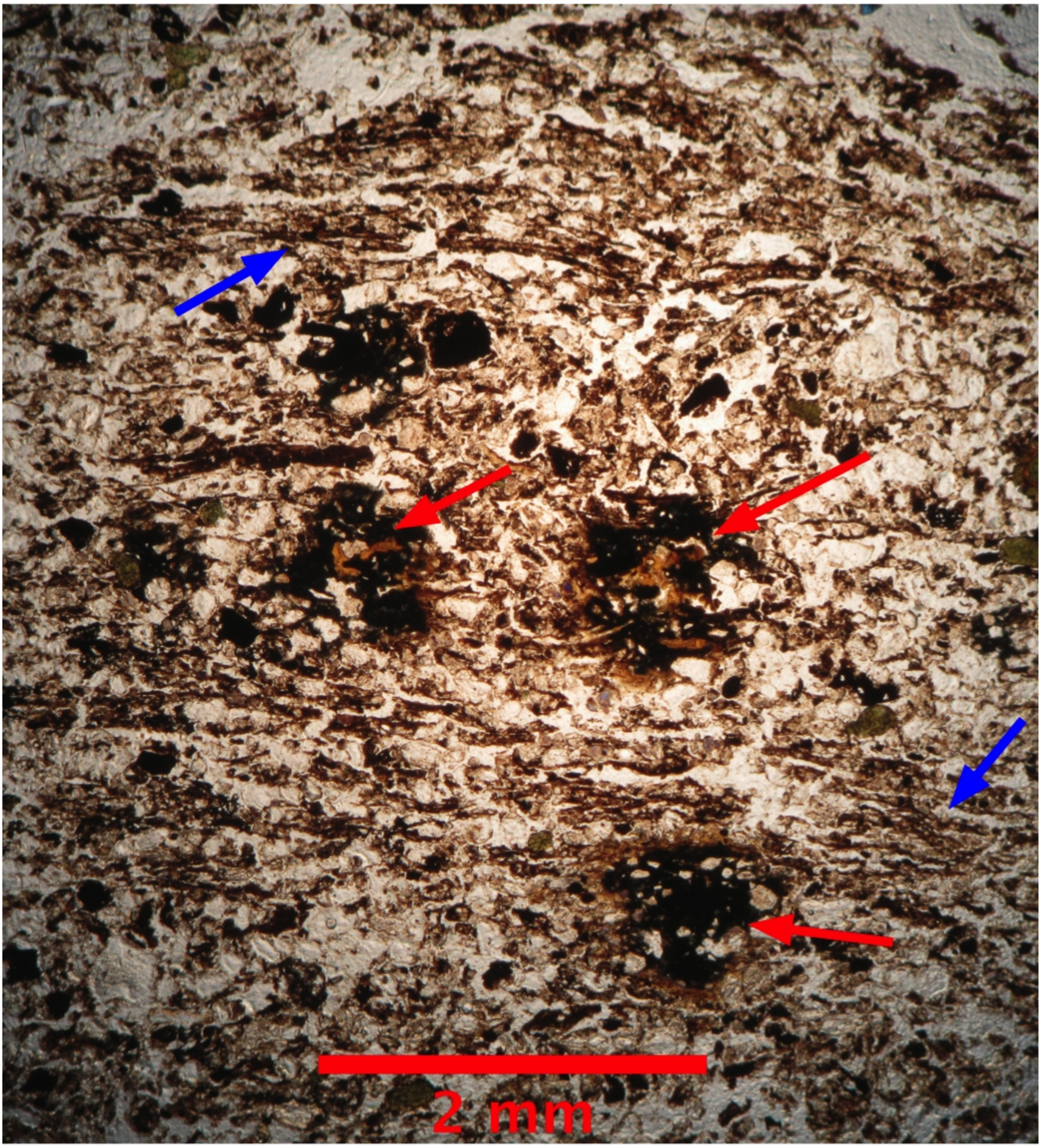
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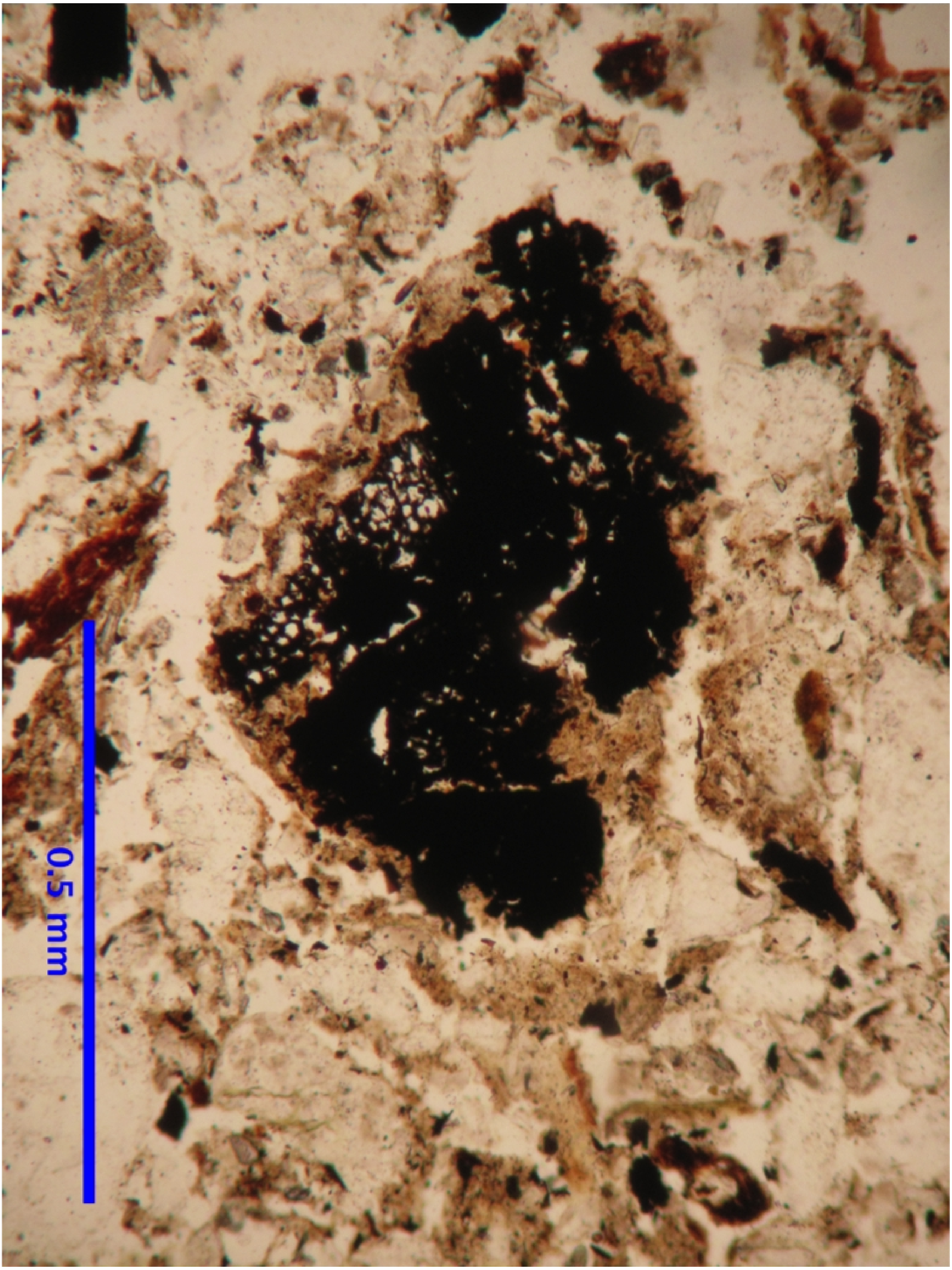
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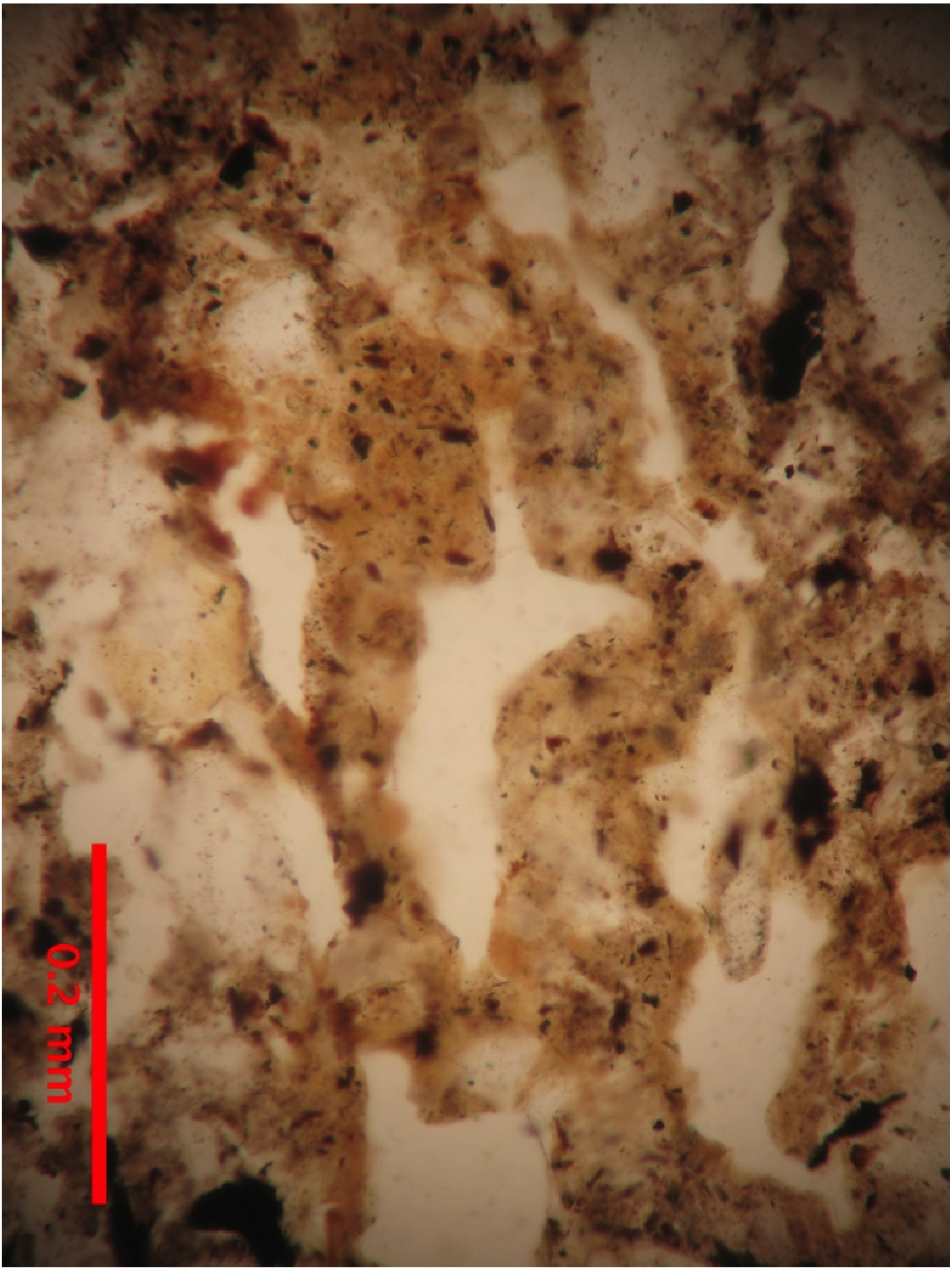
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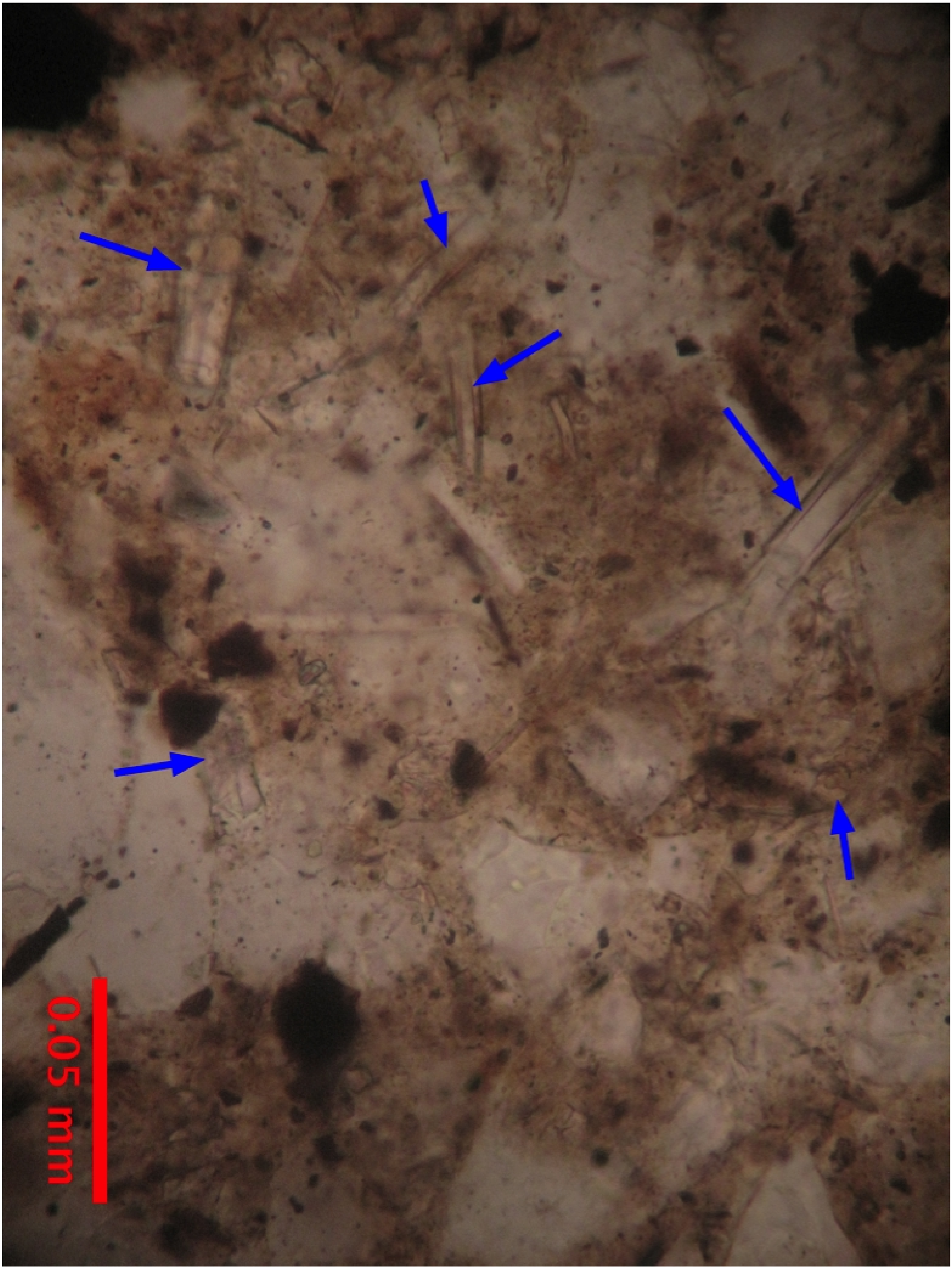
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